FINAL SUBMITTAL

VOLUME I REPORT AND APPENDICES A-F

FEASIBILITY STUDY FOR EXPANSION OF ENERGY MONITORING AND CONTROL SYSTEM (EMCS) FORT DRUM, NEW YORK

Prepared for

NORFOLK DISTRICT CORPS OF ENGINEERS, CENAO-EN-MC 803 FRONT STREET, NORFOLK, VIRGINIA 23510

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LIST OF ABBREVIATIONS

AC - air conditioning

ACC - anticipated contract cost

ACCU - air cooled condensing unit

ACM - asbestos containing material

ACU(s) - auxiliary control unit(s)

AHU - air handling unit

AI - analog input

AO - analog output

ASCII - American Standard Code for Information Interchange

ASHRAE - American Society of Heating, Refrigeration, and Air conditioning Engineers

B/C - benefit-to-cost ratio

BCD - binary coded decimal

BLDG - building

BEACON - Building Energy Simulation Program

Btu - British thermal units

Btuh - British thermal units per hour

B/W - black and white

C - Celsius

CCC - central communications controller

ccf - one hundred (100) cubic feet

CCU - central control unit

cf - cubic foot, cubic feet

cfm - cubic feet per minute

CLM - command line mnemonic

CLMI - command line mnemonic interpreter

COE - Corps of Engineers

COS - central operator station

CPU - central processing unit

CRT - cathode ray tube

CU(s) - control unit(s)

CWE - current working estimate

d - day(s)

DCP - duty cycle program

DEH - Directorate of Engineering and Housing

DHW - direct memory access

DI - digital input

DO - digital output

DOD - Department of Defense

DPW - Department of Public Works

DTM - data transmission media

DX - direct expansion

E/C - energy-to-cost ratio

ECIP - Energy Conservation Investment Program

ECO - energy conservation opportunity

EEAP - energy engineering analysis program

eff - efficiency

elec. - electricity

EMC - EMC Engineers, Inc.

EMCS - energy monitoring and control system

EMI - electromagnetic interference

ESCO - energy service company

EZ-DOE - Building Energy Simulation Program

F - Fahrenheit

FO - fiber optic(s)

ft - foot, feet

ft² - square feet

FY - fiscal year

gal - gallon(s)

hp - horsepower

hr - hours(s)

H & V - heating and ventilating

HVAC - heating, ventilation, and air conditioning

in. - inch(es)

I/O - input/output

kBtu - one thousand British thermal units

kcf - one thousand cubic feet

klb - one thousand pounds

kva - kilovolt - ampere

kW - kilowatt, one thousand watts

kWh - kilowatt-hour, one thousand watt-hours

1b - pound(s)

LCCA - life cycle cost analysis

LCCID - life cycle cost in design

LED - light emitting diode

LPG - liquefied petroleum gas

MAU - make-up air unit

MBtu - one million Btu

MCR - master control room

MHz - megahertz

Mh - man-hours(s)

mo - months(s)

MW - megawatt, one million watts

MWh - megawatt-hour, one million watt-hours

MZAHU - Multizone air handling unit

NA - Not active or Not applicable

NG - natural gas

NOAA - National Oceanic and Atmospheric Administration

no. - number

OA - outside air

O&M - operation and maintenance

PC - personal computer

PM - preventative maintenance

PROM - programmable read-only memory

psi(a)(g) - pounds per square inch (absolute) (gage)

RAM - random access memory

RCU(s) - remote control unit(s)

RTC - real-time clock

RTDOS/E - real-time disk operating system /executive

S&A - Supervision and Administration

scfm - sea-level cubic feet per minute

SES - shared energy savings

SIOH - supervision, inspection, and overhead

SIR - savings-to-investment ratio

SPW - single present worth

sq.ft. - square feet

st/sp - start/stop

stm - steam

SZAHU - single zone air handling unit

t - ton

temp - temperature

TRY - test reference year

UA - overall heat transfer coefficient (Btu/hr/ft²/°F)

UCU(s) - unitary control unit(s)

UH - unit heater

UMCS - utility monitoring and control system

UPW - uniform present worth

VAV - variable air volume

wk - week(s)

yr - year(s)

EXECUTIVE SUMMARY

OBJECTIVE

This Energy Monitoring and Control System Feasibility Study was conducted for the Norfolk District, Corps of Engineers. Its purpose was to determine the energy conservation and economic benefits of a base-wide Energy Monitoring and Control System (EMCS) to control building mechanical and electrical systems at Fort Drum.

ALTERNATIVES

A total of 115 buildings were analyzed to determine the economic benefits of EMCS monitoring and control. Three alternatives were evaluated for Fort Drum:

- Alternative 1: Expand the Trane Tracer 100 EMCS to the buildings by adding more TRANE hardware and dial-up telephone lines to these buildings, and programming the data base and control sequences. The system would include the original 16 buildings plus any new buildings which were economically justified. The disadvantage to Alternative 1 is that the Trane Trace 100 EMCS technology is becoming obsolete. Also, the expansion of this system would have to be sole-sourced, which would increase the system cost. The additional cost for sole-sourcing is not predictable; therefore, it is not included in this analysis.
- Alternative 2: Install a new EMCS in parallel with the existing Trane Tracer 100 EMCS, thus ending up with two EMCS both operating over dial-up telephone lines. This would require installing a new central workstation and new field panels to the new buildings, telephone lines in the new buildings, and programming the data base and control sequences. The disadvantage to Alternative 2 would be maintaining two EMCS.
- Alternative 3: Install a new EMCS in place of the existing Trane Tracer 100 EMCS, plus add the new buildings. The new EMCS would utilize dial-up telephone line data transmission media (DTM), and would incur the costs of installing a new central workstation and new field panels in the new buildings and in the buildings with the Trane Tracer hardware. The disadvantage to Alternative 3 is the high cost, which thereby eliminates many buildings from inclusion in the EMCS. The advantage to alternative 3 is that the system would use the latest technology. Also, there would be an advantage in maintaining a single EMCS system.

METHODOLOGY

For each of the 115 buildings, implementation costs, energy savings, and manpower cost avoidance were determined for each heating, ventilation, and air-conditioning (HVAC) system, for each energy management function. Any energy management function which had a poor simple payback was dropped from the project. The remaining implementation costs and energy savings were summarized and the buildings were ranked in order of priority according to the savings-to-investment ration (SIR) of each. A project life cycle cost analysis (LCCA) was then performed for the three alternatives.

EMCS OPERATIONS AND MAINTENANCE

It is recommended Fort Drum add two EMCS operators, more formally classified as "utility systems controllers," to operate and manage the additional buildings included in this expansion project.

Correct and continuing maintenance of EMCS equipment is essential if the maximum benefits of the system are to be realized. It is recommended that this equipment be maintained and calibrated under a maintenance contract by a manufacturer's service representative. The costs for additional system operators and a maintenance contract were included in the economic evaluation of the project.

CONCLUSIONS

- Of the 115 buildings evaluated, 110 buildings would provide an SIR greater than 1.0, if included in the EMCS, under Alternatives 2 or 3.
- The estimated construction cost for Alternative 3, to include the new buildings and upgrade the existing buildings was \$3,335,539, only \$521,041 more than Alternative 2.
- Including those HVAC and utility systems which have sufficient cost avoidance to justify connection to the EMCS, resulted in controlling and monitoring 4,931 points.

RECOMMENDATIONS

• It is recommended that an Energy Conservation Investment Program (ECIP) project be developed to provide a new EMCS at Fort Drum to control and monitor systems in 99 buildings without an existing control system, as evaluated in this study, plus replace the existing hardware in the 16 buildings connected to the existing Tracer system.

Alternative 3 would allow Fort Drum to have a single EMCS. The benefits of having a single EMCS are in the operation and maintenance of one EMCS, instead of two parallel EMCS. The EMCS should consist of new PC-based front-end computers communicating to building Remote Control Units (RCUs), Auxiliary Control Units (ACUs), and Unitary Control Units (UCUs), to control and monitor 4,931 points.

• It is recommended that all data transmission media be FO cable. A new data transmission system, consisting of contractor-installed aerial and underground FO cable is recommended for all data communication needs to the 99 buildings without an existing control system, recommended for the EMCS. It is also recommended that the existing FO DTM in the 99 buildings without an existing control system.

It is recommended that Fort Drum hire two additional EMCS operators for the EMCS.

FORT DRUM SUPPORT

To be cost effective, the EMCS will need strong support from Fort Drum. If it does not get this support, large sums of money may be spent on an EMCS which never meets the Fort Drum cost savings goals. The cost effectiveness of an EMCS depends on several factors, including the following:

- Proper training and motivation of operators to use a large, expensive EMCS.
- Coordination between EMCS operations and DEH personnel, contractors, and others, to reduce both wasted materials and labor, and duplication of effort.
- Basic training of shops personnel to assure their activities do not excessively hinder EMCS operations. Education will enable shops personnel to use the EMCS in their operation and maintenance (O&M) and utilities areas and thereby improve overall cost effectiveness.
- High priority of funding for EMCS maintenance in order to keep the system in good operating condition.
- Obtaining a maintenance contract for EMCS hardware and software.
- Periodic verification and validation of energy and O&M cost savings to ensure that the EMCS is performing as planned.

If successfully implemented, the EMCS can assist all personnel in carrying out their missions. The EMCS can save energy, predict equipment failure, detect equipment failure quickly, and schedule preventive maintenance. Significant potential for cost avoidance exists at Fort Drum if EMCS

administration, operations, and maintenance activities are properly planned and implemented, and if the EMCS is used to its full capability. The existing system has proven that an EMCS will significantly lower utility costs for the Government.

TABLE ES-1 SYSTEM ECONOMICS

SYSTEM ECONOMICS	ALTERNATIVE 1 1995 \$	ALTERNATIVE 2 1995 \$	ALTERNATIVE 3 1995 \$
Anticipated Contract Cost (\$)	2,763,121	2,814,498	3,335,539
Total Investment, Per ECIP Guidance (\$)	3,080,881	3,138,166	3,719,127
Annual Savings (MBtu)	182,855	182,855	182,855
First Year Energy Savings (\$)	1,422,972	1,422,972	1,422,972
Annual Maintenance Manhours Savings (\$)	56,820	56,820	56,820
Annual Electrical Demand Savings (\$)	2,653	2,653	2,653
Annual Maintenance Cost (\$)	(50,000)	(50,000)	(50,000)
Total Non-Energy Annual Recurring Savings (\$)	6,820	6,820	6,820
Net First Year Savings (\$)	1,429,792	1,429,272	1,429,272
Simple Payback (years)	2.15	2.19	2.60
Net Discounted Savings (\$)	12,849,270	12,849,270	12,849,270
SIR	4.17	4.09	3.45

Table ES-2, starting on page ES-5, provides a summary of identical buildings which were grouped for the purpose of analysis.

Table ES-3 on page ES-6 summarizes the potential energy savings for Alternative 3. Column A of this table lists the savings for the building and systems analyzed in this feasibility study and recommended for connection to the EMCS for Alternative 3. Column B lists the energy usage incurred at Fort Drum in FY94. Column D lists the percent savings predicted for the EMCS, compared to FY94. Table ES-4 on page ES-6 provides similar information.

TABLE ES-2 SIMILAR BUILDINGS

GROUP	BUILDING	BUILDINGS WITH SIMILAR	BUILDING
NO.	ANALYZED	CONSTRUCTION	USE
1	36		Medical Center
2	1750	1240	Motor Repair Shop
3	2060	2050, 2072, 2074, 2070	Mnt Hangar Avum -Hangar Zone
4	2060		Mnt Hangar Avum -Ops Zone, 24-Hour Ops
5	2065		AF Ops building 24-Hr Ops
6	2065	·	AF Ops building Admin
7	4230		Mini-Mall w/ Gas
8	4305	10050	Physical Fitness Center
9	4530		SMA Building
10	10000		DIV CMD/CNTL Building
11	10205		Dental Clinic
12	10207	10502	Exchange/Club
13	10506		Clinic W/O Beds
14	10522	30, 173, 175, 4422, 4432, 4412, 4414, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Admin
15	10522	30, 173, 175, 4412, 4414, 4422, 4432, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Barrack
16	10550	30, 175, 4450, 10150, 10250, 10450, 10650	Enl Pers Din

TABLE ES-2 SIMILAR BUILDINGS

(Concluded)

GROUP	BUILDING	BUILDINGS WITH SIMILAR	BUILDING
NO.	ANALYZED	CONSTRUCTION	USE
17	10630	119, 174, 4400, 4410, 4420, 4430, 10100,	Bn HQ Bldg
		10110, 10120, 10130, 10200, 10210,	
		10220, 10230, 10400, 10410, 10420,	
		10500, 10510, 10520, 10610, 10620,	
		10640	
18	10670	4475, 4485, 4486, 10170, 10270, 10470,	Veh Mnt Shop
		10480, 10570, 10580, 10660, 10680	
19	10715		Post Safety/LEA 1st
			Floor
20	10715		Post Safety/LEA 2nd
			Floor
21	10730		Clo Sales/Retail/
			Commissary
22	10745	4325, 4330, 10790, 10785	Child Support Center
23 10785		4405, 10030	Chapel/Rel Ed/ Child
			Care Cnt -RE/CC
			Zone
24	10785	4405, 10030	Chapel Zone
25	10785	4405, 10030	Chapel Offices Zone
26	11050		Clinic W/O Beds/
			Supply/Incin-
			Non-Emergency
27	11050		Clinic W/O Beds/
			Supply/Incin-
			Emergency
28	2060	2050, 2070, 2072, 2074	Mnt Hangar Avum-
			Ops Zone M-F 0600-
			1700

TABLE ES-3 ENERGY SAVINGS SUMMARY

	(A) ANNUAL SAVINGS	(B) CURRENT USAGE	(C) USAGE AFTER IMPLEMEN- TATION	(D) % SAVINGS (A)/(B)
Electricity (kWh)	15,618,500	97,210,000	81,591,500	16.07%
No. 2 Fuel Oil (MBtu)	26,627	327,432	300,805	8.13%
High Temperature Hot Water	102,697	518,556	415,859	19.80%
Totals (MBtu)	182,630	1,177,766	995,136	15.51%

TABLE ES-4 ENERGY COST SAVINGS SUMMARY

	(A) ANNUAL SAVINGS (\$)	(B) ANNUAL CURRENT USAGE (\$)	(C) % SAVINGS (A)/(B)
Electricity	854,331	5,317,387	16.07%
No. 2 Fuel Oil (MBtu)	113,271	1,392,896	8.13%
High Temperature Hot Water	452,894	2,286,832	19.80%
Totals	1,420,497	8,997,115	15.79%

SECTION 1.0

INTRODUCTION

1.1 AUTHORITY FOR ENERGY MONITORING AND CONTROL SYSTEM (EMCS) FEASIBILITY STUDY

This Energy Monitoring and Control System (EMCS) Feasibility Study was conducted and this report prepared under Contract No. DACA01-94-D-0033, Delivery Order 0006, issued by the Norfolk District Corps of Engineers on 28 September 1994.

1.2 PURPOSE OF ENERGY MONITORING AND CONTROL SYSTEM FEASIBILITY STUDY

The purpose of this Feasibility Study was to determine the economic feasibility of adding additional buildings to the existing Energy Monitoring and Control System at Fort Drum, New York, as outlined in the Scope of Work, below.

1.3 SCOPE OF WORK

The Scope of Work for this Feasibility Study is presented in Appendix A, which also includes a confirmation notice of instructions furnished at the entrance interview conference.

In summary, the requirements for the Feasibility Study include:

- Review data for the existing EMCS.
- Conduct a field survey of mechanical and electrical systems to be monitored and controlled by the EMCS in 130 buildings, including 16 Trane Tracer buildings.
- Evaluate selected buildings to determine which EMCS applications are feasible, based on utility and labor cost avoidance.
- Determine the feasibility of connecting buildings to the EMCS.
- Perform a life cycle cost analysis (LCCA) to reflect savings-to-investment (SIR) ratio calculations and simple payback.
- Prepare a life cycle cost in design (LCCID) summary for each recommended project developed.

- Prepare a DD Form 1391, Project Development Brochure, and supporting data.
- Illustrate the methods and justifications of the approaches taken.
- Prepare a comprehensive report.
- Indicate the work accomplished to date.
- Submit the plan of work remaining to complete the study.

1.4 APPROACH

The approach taken in performing the Feasibility Study consisted of the following:

- Performing a field survey to document the hardware and operational information of the existing heating, ventilating, and air conditioning (HVAC) systems.
- Collecting available information and data relative to historical energy usage, current utility rate schedules, building and equipment utilization, and existing energy conservation efforts.
- Reviewing existing building drawings, as available.
- Developing a preliminary point schedule which includes EMCS functions for each applicable building.
- Evaluating the energy savings available from each energy management function for each system, with the aid of computer energy simulations for typical buildings.
- Determining the cost of implementing each function for each system.
- Evaluating the implementation costs and energy savings for each of the functions per system in the buildings evaluated by extrapolating the computer energy simulation results.
- Summarizing savings and costs for selected functions and systems for each building, and ranking the buildings in order of priority of their SIR.

1.5 WORK ACCOMPLISHED

With the completion of this Final Submittal, the following items have been accomplished:

- Reviewed data for the existing EMCS.
- Conducted a site survey of the 130 buildings.
- Conducted entrance interview.
- Evaluated base energy and EMCS application functions using computer energy modeling for selected buildings.
- Determined utility and labor cost avoidance for EMCS application functions for similar buildings.
- Prepared and delivered Interim Submittal.
- Attended Interim Submittal review conference.
- Updated any calculations and/or cost estimates as related to EMCS from comments received at the Interim Submittal review conference.
- Determined EMCS basewide data transmission medium (DTM).
- Prepared DTM cost estimates.
- Prepared LCCID summary for recommended project.
- Prepared narrative summary of conclusions and recommendations.
- Prepared separately bound Executive Summary.
- Prepared draft DD1391 for recommended project.
- Provided Prefinal Submittal.
- Made final revisions and corrections.
- Presented Final Submittal.
- Conducted exit interview.

SECTION 2.0

FACILITY DATA

2.1 GENERAL

This Feasibility Study evaluates the economic benefits of adding additional buildings to the existing EMCS. These buildings include administrative buildings, barracks, maintenance shop buildings, dining facilities, retail sales stores, clubs, recreational facilities, and other service-type buildings.

2.2 BUILDINGS INCLUDED IN ANALYSIS

A total of 115 buildings were analyzed to determine the economic benefits of EMCS monitoring and control. The buildings evaluated for the EMCS are shown in Table 2-1, starting on page 2-2.

Various groups of buildings were determined to be identical in construction and usage. Table 2-2, starting on page 2-7, lists the 28 building sections analyzed and those similar buildings which were extrapolated to the building sections analyzed.

For the purpose of analysis, 20 buildings were modeled with a computer energy simulation program. Four of these buildings were broken down into two separate zones, and two buildings were broken into three separate zones. Therefore, a total of 28 building sections were simulated.

BLDG NO.	BUILDING USE	BUILDING AREA (ft²)
30	BRKS & MESS HALL	23,446
36	MEDICAL CENTER	26,440
119	BN HQ & CLASSROOM	14,954
173	BARRACKS	65,700
174	соно	24,161
175	BRKS & MESS HALL	85,139
176	ELECTRICAL SUBSTATION	
1240	TOE MAINT	40,491
1750	MOTOR REPAIR SHOP	38,336
2049	WSAAF HANGAR	32,540
2050	MNT HANGER AVUM	32,724
2060	MNT HANGER AVUM	58,470
2065	AF OPS BLDG	24,466
2070	MNT HANGER AVUM	102,256
2072	MNT HANGER AVUM	45,639
2074	MNT HANGER AVUM	32,883
2168	SUBSTATION	1,815
2792	AMMO INSPECTION	7,424
4230	MINI MALL W/GAS	10,220
4305	PHYS FITNESS CENTER	32,157
4325	SKILL DEV CENTER	21,720
4330	RECREATION CNTR	12,968
4350	OPEN DIN NCO	13,310
4400	RGT HQ BUILDING	13,712

(Continued)

BLDG NO.	BUILDING USE	BUILDING AREA (ft²)
4405	UNIT CHAPEL	9,420
4410	BN HQ BLDG	12,838
4412	ENL BK W/O DIN	51,280
4414	ENL BK W/O DIN	35,198
4420	BN HQ BLDG	13,007
4422	ENL BK W/O DIN	34,190
4430	BN HQ BLDG	12,451
4432	ENL BK W/O DIN	35,294
4450	ENL PERS DIN	12,730
4475	VEH MAINT SHOP	87,687
4485	VEH MAINT SHOP	37,717
4486	VEH MAINT SHOP	27,733
4525	DOL WAREHOUSE	115,000
4530	SMA BUILDING	195,670
10000	DIV CMD/CNTRL BLDG	80,294
10030	UNIT CHAPEL	9,420
10050	PHYS FIT CENTER	77,130
10100	BRIGADE HQ BLDG	11,250
10110	BN HQ BLDG	12,450
10112	ENL BK W/O DIN	49,162
10114	ENL BK W/O DIN	47,038
10120	BN HQ BLDG	12,450
10122	ENL BK W/O DIN	49,156
10124	ENL BK W/O DIN	47038
10130	BN HQ BLDG	13,305

(Continued)

BLDG NO.	BUILDING USE	BUILDING AREA (ft²)
10132	ENL BK W/O DIN	50,156
10134	ENL BK W/O DIN	59,693
10150	ENL PERS DIN	18,460
10170	VEH MAINT SHOP	25,984
10200	BRIGADE HQ BLDG	11,248
10205	DENTAL CLINIC	18,546
10207	EXCHANGE/CLUB	18,199
10210	BN HQ BLDG	12,448
10212	ENL BK W/O DIN	51,794
10214	ENL BK W/O DIN	48,961
10220	BN HQ BLDG	12,448
10222	ENL BK W/O DIN	51,794
10224	ENL BK W/O DIN	48,961
10230	BN HQ BLDG	12,448
10232	ENL BK W/O DIN	51,794
10234	ENL BK W/O DIN	57,581
10250	ENL PERS DIN	18,553
10270	VEH MAINT SHOP	25,984
10400	BDE HQ BLDG	11,249
10410	BN HQ BLDG	12,450
10412	ENL BK W/O DIN	54,872
10414	ENL BK W/O DIN	59,078
10420	BN HQ BLDG	12,450
10422	ENL BK W/O DIN	47,300
10450	ENL PERS DIN	9,486

(Continued)

BLDG NO.	BUILDING USE	BUILDING AREA (ft²)
10470	VEH MAINT SHOP	32,213
10480	VEH MAINT SHOP	28,057
10500	BDE HQ BLDG	11,249
10502	OPEN DIN CONSOL	18,199
10506	CLINICS W/O BEDS	18,386
10510	BN HQ BLDG	12,450
10512	ENL BK W/O DIN	52,266
10514	ENL BK W/O DIN	45,719
10520	BN HQ BLDG	12,450
10522	ENL BK W/O DIN	43,886
10524	ENL BK W/O DIN	45,746
10550	ENL PERS DIN	15,560
10570	VEH MAINT SHOP	25,827
10580	VEH MAINT SHOP	27,310
10610	BN HQ BLDG	12,452
10612	ENL BK W/O DIN	53,892
10614	ENL BK W/O DIN	44,510
10620	BN HQ BLDG	13,225
10622	ENL BK W/O DIN	52,990
10630	BN HQ BLDG	12,452
10632	ENL BK W/O DIN	51,794
10640	BN HQ BLDG	12,452
10642	ENL BK W/O DIN	43,790
10644	ENL BK W/O DIN	40,864
10650	ENL PERS DIN	12,578

(Concluded)

BLDG NO.	BUILDING USE	BUILDING AREA (ft²)
10660	VEH MAINT SHOP	41,968
10670	VEH MAINT SHOP	43,519
10680	VEH MAINT SHOP	39,679
10690	ADP BUILDING	26,400
10710	FIRE STATION	5,900
10715	POST SAFETY/LEA	49,495
10730	CLO SALES STORE/EXCHANGE	76,848
10732	CLASS VI	4,000
10745	CHILD SUPPORT CENTER	23,500
10785	CHILD CARE CNTR/RELG EDUC/CHAPEL	53,480
10790	YOUTH CENTER	21,820
11050	CLINIC W/O BEDS	67,295
11130	ELEC SUBSTATION	1,550
11142	ENTOMOLOGY FAC	1,465
11144	REFUSE COLL BLDG	20,825
21510	MAIN WASH	19,247

TABLE 2-2 BUILDINGS OF SIMILAR CONSTRUCTION

GROUP NO.	BUILDING ANALYZED	BUILDINGS WITH SIMILAR CONSTRUCTION	BUILDING USE
1	36		Medical Center
2	1750	1240	Motor Repair Shop
3	2060	2050, 2072, 2074, 2070	Mnt Hangar Avum -Hangar Zone
4	2060		Mnt Hangar Avum -Ops Zone, 24-Hour Ops
5	2065		AF Ops building 24-Hour Ops
6	2065		AF Ops building Admin
7	4230		Mini-Mall w/ Gas
8	4305	10050	Physical Fitness Center
9	4530		SMA Building
10	10000		DIV CMD/CNTL Building
11	10205		Dental Clinic
12	10207	10502	Exchange/Club
13	10506		Clinic W/O Beds
14	10522	30, 173, 175, 4422, 4432, 4412, 4414, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Admin
15	10522	30, 173, 175, 4412, 4414, 4422, 4432, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Barrack
16	10550	30, 175, 4450, 10150, 10250, 10450, 10650	Enl Pers Din

TABLE 2-2 BUILDINGS OF SIMILAR CONSTRUCTION

(Concluded)

GROUP NO.	BUILDING ANALYZED	BUILDINGS WITH SIMILAR CONSTRUCTION	BUILDING USE
17	10630	119, 174, 4400, 4410, 4420, 4430, 10100, 10110, 10120, 10130, 10200, 10210, 10220, 10230, 10400, 10410, 10420, 10500, 10510, 10520, 10610, 10620, 10640	Bn HQ Bldg
18	10670	4475, 4485, 4486, 10170, 10270, 10470, 10480, 10570, 10580, 10660, 10680	Veh Mnt Shop
19	10715		Post Safety/LEA 1st Floor
20	10715		Post Safety/LEA 2nd Floor
21	10730		Clo Sales/Retail/ Commissary
22	10745	4325, 4330, 10790, 10785	Child Support Center
23	10785	4405, 10030	Chapel/Rel Ed/ Child Care Cnt -RE/CC Zone
24	10785	4405, 10030	Chapel Zone
25	10785	4405, 10030	Chapel Offices Zone
26	11050		Clinic W/O Beds/ Supply/Incin- Non-Emergency
27	11050		Clinic W/O Beds/ Supply/Incin- Emergency
28	2060	2050, 2070, 2072, 2074	Mnt Hangar Avum-Ops Zone M-F 0600-1700

2.3 ENERGY SOURCES

Electricity, No. 2 fuel oil, and liquefied petroleum gas (LPG) are sources of energy which could be conserved by the EMCS. These energy sources are discussed below.

2.3.1 Electricity

Electrical energy is supplied to Fort Drum under contract from Niagara-Mohawk Company.

2.3.1.1 Electrical Demand Charges

Niagara-Mohawk Company's electrical demand rate includes the following characteristics:

- The monthly demand is the higher of the current monthly electrical demand or the highest electrical demand which occurred in the last eleven months.
- The actual billed cost for electrical demand is based on an average of the prior 12 months' electrical demand, as described above.

The demand rate from Niagara-Mohawk Company is \$6.88 per kW, per month.

2.3.1.2 Electrical Energy Charges

The electrical off-peak energy charge from Niagara-Mohawk Company is \$0.0547 per kWh. The electrical on-peak energy charge is \$0.652 per kWh. Niagara-Mohawk peak hours for Fort Drum are defined as the hours between 8 a.m. and 10 p.m. weekdays, with the exception of weekdays which are Government holidays. All other hours are defined as off-peak.

2.3.2 No. 2 Fuel Oil

No. 2 fuel oil is used as a source of heating at Fort Drum. The current rate for No. 2 fuel oil is \$0.59 per gallon (\$4.25/MBtu).

2.3.3 High Temperature Hot Water (HTHW)

High temperature hot water is used as a source of heating in the majority of the buildings at Fort Drum. The energy charge from the Jones Cogeneration Plant is \$4.41 per MBtu. For FY94, there was a capacity charge that averaged a relatively constant \$511,175 per month. This capacity charge was excluded from our HTHW unit cost. However, the fuel charge was included and averaged roughly \$0.22 per MBtu.

2.3.4 Natural Gas

Natural gas is used as a source of heating for some of the Central Plant boilers at Fort Drum. The current rate of natural gas from Niagara-Mohawk is \$0.42 per therm (\$4.2 per MBtu).

2.3.5 <u>Liquefied Petroleum Gas (LPG)</u>

LPG is used as a source of heating at Fort Drum. The current rate for LPG is \$0.58 per gallon.

2.4 ENERGY CONSUMPTION ANALYSIS

Historical energy usage data at Fort Drum was obtained for FY94 in order to compare energy savings estimates with actual consumption.

2.4.1 Electricity

Electrical energy consumption for FY94 is tabulated in Table 2-3 on the following page. The monthly electrical consumption for FY94 varied from a minimum of 6,970,000 kWh in September, to a maximum of 9,580,000 kWh in February. The total electrical billing for FY94 was \$7,153,364. The monthly electrical consumption is illustrated graphically by Figure 2-1 on the following page.

TABLE 2-3 ELECTRICAL CONSUMPTION - FY94

MONTH	kWh CONSUMPTION	kW* CONSUMPTION
OCTOBER	7,440,000	12,000
NOVEMBER	7,940,000	13,000
DECEMBER	9,070,000	13,200
JANUARY	9,230,000	13,800
FEBRUARY	9,580,000	13,850
MARCH	8,640,000	13,150
APRIL	7,650,000	13,000
MAY	8,030,000	12,000
JUNE	7,400,000	11,000
JULY	8,100,000	11,200
AUGUST	7,160,000	13,000
SEPTEMBER	6,970,000	12,000
TOTAL	97,210,000	151,200

^{*} Approximate FY91 data.

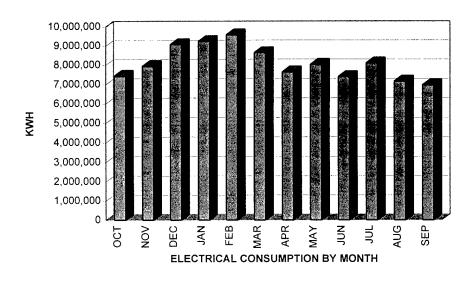


FIGURE 2-1. ELECTRICAL CONSUMPTION - FY94

2.4.2 No. 2 Fuel Oil

No. 2 fuel oil consumption for FY94 is tabulated in Table 2-4 below. The total No. 2 fuel oil consumption for FY94 was 2,402,286 gallons. The total No. 2 fuel oil billing for FY94 was \$1,742,575.71. The monthly No. 2 fuel oil consumption is illustrated graphically by Figure 2-2 on the following page.

TABLE 2-4 NO. 2 FUEL OIL CONSUMPTION - FY94

MONTH	GALLONS CONSUMPTION
OCTOBER	93,049
NOVEMBER	249,104
DECEMBER	366,095
JANUARY	471,132
FEBRUARY	384,606
MARCH	363,465
APRIL	206,271
MAY	119,619
JUNE	67,138
JULY	44,193
AUGUST	19,999
SEPTEMBER	17,615
TOTAL	2,402,286

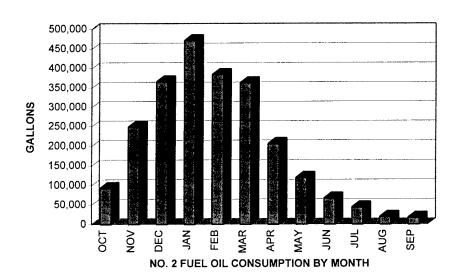


FIGURE 2-2. NO. 2 FUEL OIL CONSUMPTION - FY94

2.4.3 <u>High Temperature Hot Water (HTHW)</u>

High Temperature Hot Water (HTHW) consumption for FY94 is tabulated in Table 2-5 on the following page. The total HTHW consumption for FY94 was 518,556 MBtu. The total HTHW billing for FY94 was \$8,473,500. The monthly HTHW consumption is illustrated graphically by Figure 2-3 on the following page.

TABLE 2-5 HTHW CONSUMPTION - FY94

MONTH	MBtu
OCTOBER	35,010
NOVEMBER	47,590
DECEMBER	66,900
JANUARY	108,950
FEBRUARY	62,438
MARCH	58,528
APRIL	43,900
MAY	30,910
JUNE	16,830
JULY	14,140
AUGUST	15,540
SEPTEMBER	17,820
TOTAL	518,556

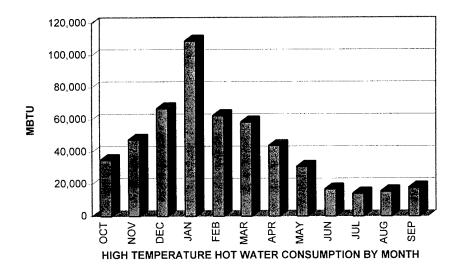


FIGURE 2-3. HTHW CONSUMPTION - FY94

2.4.4 Natural Gas

Natural gas consumption for FY93 is tabulated in Table 2-6 below. The total natural gas consumption for FY93 was 2,806,882 therms. The monthly natural gas consumption is illustrated graphically by Figure 2-4 on the following page.

TABLE 2-6
NATURAL GAS CONSUMPTION - FY93

MONTH	THERMS
OCTOBER	201,532
NOVEMBER	311,001
DECEMBER	297,515
JANUARY	396,628
FEBRUARY	488,910
MARCH	343,415
APRIL	241,463
MAY	151,253
JUNE	97,020
JULY	103,133
AUGUST	63,458
SEPTEMBER	111,554
TOTAL	2,806,882

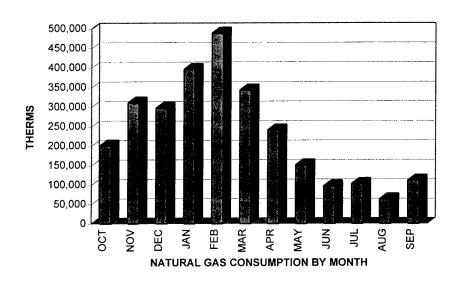


FIGURE 2-4. NATURAL GAS CONSUMPTION - FY93

2.4.5 Justification of Resource Unit Costs for Economic Analysis

The electrical cost for off-peak consumption per kWh is \$0.0547 for off-peak power. Since most of the savings are during off-peak hours (night setback and scheduled start/stop), the off-peak rate excluding demand charge was used. The demand charge based on the historical data matches the charge, indicated by Mr. Steve Rowley, Fort Drum Energy Manager, to be \$6.88 per kW.

The fuel oil cost for 1995, provided by Mr. Rowley, is \$0.59 per gallon (\$4.25/MBtu). Table 2-4 on page 2-12 is provided as a historical reference, and is based on the 1994 usage and rates.

The high temperature hot water cost for 1995, provided by Mr. Rowley, is \$4.41 per MBtu. Table 2-5 on page 2-14 is provided as a historical reference, and is based on the 1994 usage and rates.

No historical data was provided for Liquefied Petroleum Gas. The unit cost for 1995, provided by Mr. Rowley, is \$0.58 per gallon (\$6.07/MBtu).

2.5 EXISTING CONTROLS AND EMCS

2.5.1 **Existing Controls**

During the field survey of the buildings evaluated for EMCS expansion, a visible inspection was conducted to determine the general condition of the local control loops. Overall, the mechanical rooms are in good condition; the HVAC system are satisfactory; and the controls are in good condition. The maintenance staff seems to be maintaining equipment and controls, including scheduled maintenance of equipment and controls. Following are examples of problems noted:

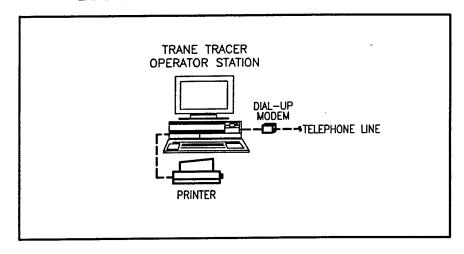
- Timeclocks are installed but the start/stop pins have been removed.
- Timeclocks are installed but not connected into the starter circuits.
- Outside air damper settings on fan systems seem to vary greatly.
- Barracks are overheating, causing GIs to open windows to control temperature.
- Insulation has been removed in several areas, such as pipes and converters, and has not been replaced.
- Occasional HTHW leaks have deteriorated insulation and corroded equipment housings.

2.5.2 Trane Tracer 100

Fort Drum has an existing Trane Tracer 100 EMCS in 16 buildings. The EMCS was designed in phases as a decentralized local building control and monitoring system. The input/output (I/O) points and functions of each building are totally independent of other buildings.

Maintenance staff interface with the system is primarily accomplished at the control room located in the maintenance building. The control room contains an IBM compatible PC, printer, and modem. On command, the PC will connect to the remote Trane Tracer 100 panels via the modem and dial-up lines. Refer to Figure 2-5, on the following page, for a description of the existing Trane Tracer 100 EMCS.

EMCS CONTROL ROOM LOCATED IN MAINTENANCE BLDG.



TRANE TRACER 100 PANELS - TYPICAL OF 15 BUILDINGS

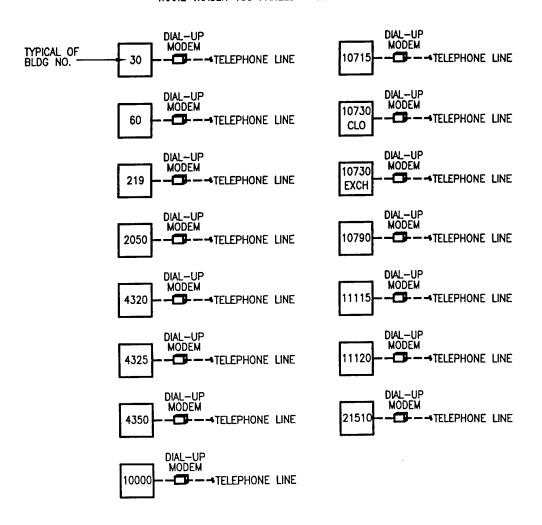


FIGURE 2-5. EXISTING TRANE TRACER 100 EMCS SYSTEM

SECTION 3.0

ENERGY MONITORING AND CONTROL SYSTEM APPLICATION

An EMCS function is a specific action performed by control software. An EMCS can be programmed to monitor and control several tasks. The name, method, and implementation approach for any particular task varies with the individual EMCS manufacturer. Variations generally depend on the particular software or hardware used by a manufacturer to accomplish each function, rather than on the task itself.

3.1 ENERGY CONSERVING EMCS FUNCTIONS

The energy conserving EMCS functions evaluated in this feasibility study include:

- Scheduled start/stop
- Optimum start/stop
- Demand limiting start/stop
- Unoccupied setback
- Ventilation/recirculation damper control
- Economizer
- Direct digital control
- Hot water outside air temperature reset
- Chilled water temperature reset.

These functions, which are described individually in Appendix B, represent the common functions applicable at Fort Drum. Not all of the EMCS functions evaluated in this study provide sufficient energy savings to justify usage in every building. These EMCS functions are described in Appendix B. The EMCS functions applicable to each system are shown in the I/O summary tables, Appendix C.2.

3.2 EMCS MONITORING FUNCTIONS

In addition to the energy conserving functions listed in Section 3.1, the EMCS can monitor the operational status and the values of operating parameters in particular areas and equipment. Data on monitored parameters may be gathered and presented to the EMCS operator in either digital or analog form. An analog monitoring point could be represented as a critical space temperature; i.e., the operator could read the actual temperature in the space at any time desired, with the EMCS programmed to signal the operator when the temperature goes outside of the programmed limits. Digital monitoring points can be characterized as an On-or-Off status indication or as an alarm signaled to the EMCS operator as the result of an alarm contact closure.

The monitoring capabilities of the EMCS will assist maintenance personnel by indicating alarm conditions, facilitating remote trouble-shooting, and generating reports to assist in scheduling equipment maintenance. This feature would be expected to be a valuable tool for maintenance personnel at Fort Drum. Theoretically, it would reduce the cost of maintenance operations by allowing more time for general service call maintenance work, and reduce casualty maintenance. It is unlikely a reduction in maintenance staff would result from this feature.

The following EMCS monitoring functions are recommended for the EMCS at Fort Drum, and the economic analysis was performed assuming their implementation. These functions are described in Appendix B:

- Run-time reports
- Temperature monitoring
- Status condition monitoring
- Energy metering.

The EMCS, either expansion or new, should be specified with a report generator having a number of standard reports, plus custom report generating capabilities. These reports provide the operators and shop personnel with valuable data for operating the EMCS, along with monitoring systems and building conditions. The standard reports specified for the EMCS, which are included on the Trane Tracer system, include:

- Status report
- Correlated alarm report
- Profile report
- Electrical power utilization report
- Energy utilization report
- Alarm report
- Lockout report
- Analog limit report
- Run-time report
- Cooling tower profile report
- Electrical peak demand prediction report
- Chiller utilization report
- Optimum start/stop report
- Out-of-service report
- Static data base report
- Real-time data base report
- DTM circuit report (Alternative 3).

SECTION 4.0

ENERGY MONITORING AND CONTROL SYSTEM REQUIREMENTS

4.1 GENERAL

Fort Drum has various alternatives for future EMCS expansion. The basic alternatives include:

- Alternative 1: Expand the Trane Tracer 100 EMCS to the buildings by adding more TRANE hardware and dial-up telephone lines to these buildings, and programming the data base and control sequences. The system would include the original 16 buildings plus any new buildings which were economically justified. See Section 2.5.2 on page 2-18 for a description of the existing Trane Tracer 100 EMCS. The disadvantage to Alternative 1 is that the Trane Trace 100 EMCS technology is becoming obsolete. Also, the expansion of this system would have to be sole-sourced, which would increase the system cost. The additional cost for sole-sourcing is not predictable; therefore, it is not included in this analysis.
- Alternative 2: Install a new EMCS in parallel with the existing Trane Tracer 100 EMCS, thus ending up with two EMCS both operating over dial-up telephone lines. This would require installing a new central workstation and new field panels to the new buildings, telephone lines in the new buildings, and programming the data base and control sequences. The disadvantage to Alternative 2 would be maintaining two EMCS.
- Alternative 3: Install a new EMCS in place of the existing Trane Tracer 100 EMCS, plus add the new buildings. The new EMCS would utilize dial-up telephone line data transmission media (DTM), and would incur the costs of installing a new central workstation and new field panels in the new buildings and in the buildings with the Trane Tracer hardware. The disadvantage to Alternative 3 is the high cost, which thereby eliminates many buildings from inclusion in the EMCS. The advantage to alternative 3 is that the system would use the latest technology. Also, there would be an advantage in maintaining a single EMCS system.

4.2 CONFIGURATIONS

The current EMCS configuration, based on the Huntsville Division Corps of Engineers current draft guide specifications, includes the following main components:

- Remote Control Units (RCU)
- Auxiliary Control Units (ACU)
- Unitary Control Units (UCU)
- Central Operator Station (COS)
- Communication Processor
- Communication Network Interface.

The EMCS, now termed "Utility Monitoring and Control System (UMCS)," is based around PC-based front-end computers, specified to be the fastest available microprocessor at the time (currently an Intel Pentium 100 MHz).

The RCU is the next level down in the system architecture. The RCU is a microprocessor-based field panel which coordinates communications and some high level control coordination with ACUs and UCUs. For a design basis, there is typically one RCU per 64 ACUs and UCUs.

The ACUs and UCUs are also micro-processor based panels, but are generally set up to control and monitor single pieces of equipment, or groups of equipment. The ACU would normally be used for large systems, and UCUs would be used for terminal devices (such as variable air volume boxes) and fan coils.

The communication processor and network interface provide the interface and management of the networks. Depending on the vendor, different networks could exist between COS, between the COS and RCUs, and between the RCUs, ACUs, and UCUs. Because the Corps of Engineers is currently changing the configurations and specifications, no further detail will be specified at this point. Where new RCUs, ACUs, and UCUs are installed, a minimum of 10% spare capacity should be provided for future use.

Any new EMCS should be a PC-based system, with RCU, ACU, and UCU system architecture.

Sensed data should be obtained from the RCUs, ACUs, and UCUs, collectively referred to as control units (CUs), which are located near the data environment monitored and controlled by the EMCS. The CUs should monitor and control all aspects of their data environments not requiring coordination with the COS. Failure procedures should be provided to automatically switch the system to manual operation in the event of a CU failure.

Hardware and configuration requirements are currently changing. If the project is funded for construction, the overall descriptions of hardware and configuration should be revised and updated as necessary to meet the most up-to-date criteria and specifications.

4.3 DATA TRANSMISSION MEDIA (DTM)

Dial-up telephone lines and modems were used for cost estimating of the communications media for building-to-work-station data transmission, for all three alternatives of the Fort Drum EMCS. Dial-up telephone lines provide low first costs and maintenance costs, and the telephone lines provide reasonable reliability.

Although more expensive than dial-up telephone lines, fiber optic (FO) data transmission systems present a unique solution to EMCS data transmission, a solution other media cannot provide as well or as reliably. FO systems will be evaluated for cost effectiveness in Alternatives 2 and 3 in the Prefinal Submittal.

In FO cables, signals are transmitted in the form of energy packets which have no electrical change. Consequently, it is physically impossible for high electric fields (lighting and high-voltage) or large magnetic fields (heavy electrical machinery, transformers, and generators) to affect the data transmission.

A number of factors favor the use of FO for EMCS and control applications:

- Elimination of ground loops and common mode voltages. This results in the following advantages:
 - Elimination of electromagnetic interference (EMI) emissions which generate "noise."
 - Immunity to electromagnetic, radio frequency, and electrical pulse interference.
 - Elimination of cross-talk.
- Safety in explosive or flammable environments.
- Capability of carrying much more information than can be carried in copper conductors.
- Fewer electrical code limitations.
- Security of information.
- Reduction in weight and size in comparison to wire cable.
- Cost effectiveness.

In addition, properly cabled optical fibers can tolerate most kinds of weather and can, without illeffect, be exposed to polluted air or immersed in many fluids, including water. Though the FO cables themselves are not susceptible to noise, FO equipment such as transceivers and modems are susceptible to noise and should therefore be located away from EMI sources.

A basic FO transmission system consists of a transmitter, a FO cable, and a receiver. Electrical information in digital or analog form is input to the transmitter, which converts it into an optical signal and outputs via a light emitting diode (LED) or injection lasers. The information, in light form, is then transmitted over the FO cable to a receiver. The receiver typically consists of a photodetector, amplifier, and demodulator.

4.4 SENSORS AND ACTUATORS

Sensors and actuators should be provided to monitor and control all remote points of the EMCS as indicated on the I/O summary tables. The sensors should include, but not be limited to, the following:

- Temperature sensors with transmitters
- Relative humidity sensors with transmitters
- Pressure sensors
- Pressure switches
- Watt meters
- Amp meters
- Flow meters
- Current transformers
- Status relays
- Start/stop control relays
- Electric/pneumatic transducers
- Pneumatic/electric transmitters.

4.5 EMCS OPERATIONS AND MAINTENANCE

4.5.1 EMCS Operations

The Trane Tracer 100 EMCS at Fort Drum is currently operated and maintained by the Directorate of Public Works (DPW) maintenance staff. Due to the limited size of the existing system, Fort Drum does not have a dedicated EMCS operator, more formally classified as "Utility System Controller." The new EMCS will require one or two EMCS operators.

4.5.2 EMCS Maintenance

Correct and continuing maintenance of EMCS equipment is essential if the maximum benefits of the system are to be realized. Without proper maintenance, the reliability of an EMCS will rapidly deteriorate, thereby reducing its energy conservation capability and benefits. In an extreme case, the EMCS could fall into disuse as the confidence of operating personnel is lost.

Maintenance of the electronic equipment and software programs requires special technical training and experience. It is recommended that this equipment be maintained and calibrated under a maintenance contract by a manufacturer's service representative. This holds true for all the automation systems currently installed at Fort Drum. The staffing recommended in Section 4.5.1 would not be sufficient to provide both operation and maintenance of the EMCS.

4.6 **AUTHORITY**

The recognition and authority of the automation systems section is an important consideration. Without the full backing of top level command, the section will have difficulty in effectively implementing the energy conserving capabilities of the EMCS.

The cost effectiveness of an EMCS depends on several factors, including:

- Training and motivation of operators to properly use a sophisticated EMCS.
- Coordination between EMCS operations and maintenance personnel, contractors, and others, to reduce wasted materials, labor, and duplication of effort.
- Basic training of maintenance personnel, to assure their activities do not excessively hinder EMCS operations. Education will enable maintenance personnel to use the EMCS in operating and maintenance (O&M) and utilities areas, thereby improving the overall cost effectiveness.
- High priority of funding for EMCS maintenance, in order to keep the system in good operating condition.
- Obtaining a maintenance contract for EMCS hardware and software.
- Periodic verification and validation of energy and O&M cost savings, to ensure the EMCS is performing as planned.

If successfully implemented, the EMCS can assist all O&M personnel in carrying out their missions. The EMCS can save energy, predict equipment failure, detect equipment failure quickly; and schedule preventive maintenance. There is significant potential for cost avoidance at Fort

Drum if EMCS administration, operations, and maintenance activities are properly planned and implemented, and the EMCS is used to its full capability. The existing Trane Tracer 100 EMCS has proven that an EMCS will lower utility costs for the Government.

4.7 REPAIR OF EXISTING CONTROLS

Some EMCS functions require an interface with existing local control devices, which must be in working order for the EMCS to function properly. Local control devices consist of starters, valve actuators, and various other local control components. Prior to the EMCS installation, the maintenance of the following items should be implemented on all existing systems:

- Safety control components, such as firestats, freezestats, smoke detectors, pressure controls, and temperature controls should be in proper working order.
- Fan belt alignment and tension should be checked on all systems.
- Starters should be checked for proper fuse or breaker size, overload protection, and proper operation.
- Control valves, damper actuators, and other equipment should be in proper working order.
- Existing EMCS modems should be checked, to ensure they are in proper working order.

In cases where new control devices are required, they should be included in the final design and provided by the EMCS contractor, if funded by O&M money. The cost to repair local controls is not included in the economic analysis. The repair cost was not included because these repairs are necessary maintenance with or without the EMCS.

SECTION 5.0

ANALYSIS METHODOLOGY

5.1 PROCEDURES

The first step in conducting this feasibility study was to review the building drawings, noting the type of building construction and the location and type of mechanical equipment. A field investigation was then conducted to verify the accuracy of the drawings and to gather data on each of the mechanical systems. During this investigation, types of EMCS functions which might be applicable to each system were determined. Fort Drum personnel were queried about present methods of system operation, building occupancy schedules, and areas where EMCS control could cause potential difficulties.

An EMCS can be large and complex when applied to large buildings and multi-building facilities. Only cost-effective systems should be selected for connection to an EMCS; proper system selection will provide optimum savings.

EMC Engineers, Inc., used a series of computer programs and analysis techniques to select the buildings, systems, and functions which would provide an optimum EMCS configuration for Fort Drum. This main analysis program, written by EMC Engineers, Inc., calculates the energy savings which result when a particular EMCS function is applied to a specific mechanical system type. Savings are calculated on a function-by-function basis for each system. Typical system configurations were developed for a range of AHUs, pumps, boilers, and chillers. The calculations follow the basic guidelines described in "CR 82.030, Standardized EMCS Energy Savings Calculations, Naval Civil Engineering Laboratory."

Energy savings were calculated using energy constants derived by computer energy simulations of actual representative buildings and weather conditions at Fort Drum, using the DOE-2 computer program. The program performs hourly energy calculations and can predict the energy consumption which would result from various heating and cooling systems and operational settings. The energy savings for the buildings not simulated were extrapolated from the energy constants derived for the representative buildings. A detailed description of the algorithms used in the analysis program is located in Appendix D.

The functions provided in the analysis program include:

- Scheduled start/stop
- Optimum start/stop
- Economizer

- Direct digital control
- Unoccupied setback
- Hot water outside air reset

- Demand start/stop of motors
- Demand start/stop of chillers

- Chilled water temperature reset
- Ventilation/recirculation damper control.

The analysis computer program also developed the I/O summary table for the proposed functions for each system, estimated the cost for the hardware to implement the functions, and split the cost between function groups. Savings and costs computed by the analysis program were then entered into a spreadsheet program to calculate the economics for various functions.

The spreadsheet program has special features which allow calculations, selection of items, sorting, and prioritization of items. This system was used for the following purposes:

- To perform economic analyses on EMCS functions, systems, and buildings.
- To sort data on the benefits provided by the EMCS to obtain the optimum system.

Based on the final selection of functions, systems, and buildings, the total savings and costs will be developed into an EMCS project.

5.2 I/O SUMMARY TABLES

The Input/Output (I/O) summary tables, included in Volume I, Appendix C.2 of this report, were developed through computer analysis for each environmental system evaluated at Fort Drum. The I/O summary tables consists of:

- All applicable EMCS functions recommended for each system.
- All the sensors and actuators required to accomplish the recommended functions.

The I/O summary tables generated for the EMCS feasibility study are meant to be as accurate as possible for depicting the proposed inputs and outputs for the final design. However, because the study uses typical system types for the analysis, the final system-by-system design may vary slightly, depending on existing control configurations.

5.3 ENERGY SAVINGS

Energy savings were calculated for each EMCS function as it applied to all systems in the buildings considered in this feasibility study. Computer programs were used to simulate 20 buildings and their systems. The various EMCS functions were then simulated on the same buildings systems, and the resulting reduction in energy consumption was determined. Interrelated EMCS functions were simulated in a manner which prevented duplication of energy savings. For example, time

program savings were always calculated first, if applicable, then followed by functions such as setback, duty cycle, economizer, and reset. From the computer simulations, constants were derived and equations were developed which allowed energy savings to be calculated for similar systems in other buildings. Volume I, Appendix D, describes the energy constants and formulae used to calculate the energy savings. The backup system-by-system energy savings calculations are provided in Volume I, Appendix E.

5.4 CONSTRUCTION COSTS

The construction cost estimates are based on the final systems and functions included in the EMCS configuration and as indicated on the I/O summary tables. The unit cost for each control device, sensor, actuator, and associated wiring was estimated separately for each EMCS function. The estimated system cost includes material and labor costs, and the contractor's overhead and profit.

The EMCS feasibility study cost estimates, found in Volume I, Appendix F, Tables F-1 and F-2, contain cost estimates for field devices, wiring, and EMCS field panels.

5.5 EMCS PRIORITIZATION

Final control functions, systems, and buildings selected for this feasibility study will be based on evaluation of simple payback and SIR.

The first step in the prioritization analysis will be to combine all of the EMCS functions for a single system which use common devices within a particular system. This allows, for example, the cost of a start/stop device to be shared by both the time schedule function and the unoccupied setback function. Those EMCS functions having a very poor simple payback will be dropped from further analysis. The final step will be to determine the building SIR based on the remaining systems and functions. Included in the building costs are the remote panels (RCUs, ACUs, and UCUs) and field device point costs. In Table F-1, the buildings are sorted based on descending SIR.

5.6 EMCS ALTERNATIVES EVALUATION

To evaluate the economics of the three alternatives discussed in Section 4.0, the following factors will be incorporated.

- Alternative 1, Expansion of Trane Tracer EMCS:
 - Costs for new dial-up telephone lines included.
 - Costs for new COS added.

- Alternative 2, New EMCS Parallel Trane Tracer EMCS:
 - Cost for new dial-up telephone lines included.
 - Cost for new COS added.
- Alternative 3, Replace Trane Tracer EMCS and Expand to New Buildings:
 - Cost for new COS added.
 - Replacement of Trane Tracer field panels included.
 - Programming and testing costs included for new and replacement points added.
 - Cost for new dial-up telephone lines included.

SECTION 6.0

RESULTS OF ANALYSIS

6.1 GENERAL

This section summarizes the results of the analysis performed for all systems in each of the 115 buildings included in this feasibility study. A summary of the savings for the selected functions and a cost breakdown for the conceptual EMCS configuration are provided.

6.2 BUILDING SUMMARY

The results of the building-by-building costs and savings analysis are summarized in Table 6-1, beginning on page 6-2. The savings and costs listed in this table include only those systems and functions which are recommended for the EMCS. The CU cost was added to the point cost to determine the field hardware cost. Using these cost values and the appropriate discount factors, the ratio (SIR) was calculated for each building.

The energy savings and building construction for the system evaluated are shown in Table 6-1, page 6-1.

6.3 RESULTING CONFIGURATION

The resulting EMCS configuration (as listed in Table 6-1) contains a combined total of 4,931 new digital and analog input and output points in 115 buildings. The number of digital inputs (DI), digital outputs (DO), analog inputs (AI), and analog outputs (AO) for each building is shown in Table 6-1.

The total savings from all building analyzed in the study amounts to \$1,422,972. This level of annual savings should be possible using any of the three alternative EMCS systems described in Section 4.0, page 4-1.

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BUILDING ECONOMIC SUMMARY
(Concluded)

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6.4 ENERGY SAVINGS

Table 6-2 below summarizes the potential energy savings for the proposed EMCS. Column A of this table lists the annual energy savings for the buildings and systems analyzed in this feasibility study and recommended for connection to the EMCS. Column B lists the energy usage incurred at Fort Drum in FY94. Column C lists the percent savings predicted for the EMCS, compared to FY94.

TABLE 6-2 ENERGY SAVINGS SUMMARY

	(A) ANNUAL SAVINGS	(B) CURRENT USAGE	(C) % SAVINGS (A)/(B)
Electricity (kWh)	15,618,498	97,210,000	16%
No. 2 Fuel Oil Total Energy (MBtu)	26,626	2,402,286	11%
High Temperature Hot Water (MBtu)	102,697	518,556	20%

6.5 IMPLEMENTATION COSTS

The total anticipated contract costs (ACC) for the three alternative EMCS configurations are listed in Table 6-3, below. The anticipated contract costs include:

- 15% overhead
- 10% profit
- 2.5% bond
- 10% contingency.

TABLE 6-3 IMPLEMENTATION COSTS

	ALTERNATIVE 1 1995 \$	ALTERNATIVE 2 1995 \$	ALTERNATIVE 3 1995 \$
Central EMCS Hardware	\$ 7,500	\$ 27,920	\$ 27,920
EMCS Software/Database	93,000	104,200	163,100
Modems for Dial-up Phone Lines	30,000	30,000	30,000
Field Hardware (including RCUs)	1,696,902	1,696,902	1,996,902
Training	33,750	33,750	33,750
Testing	84,988	90,000	105,609
Documentation and Submittals	24,000	24,000	24,000
SUBTOTAL \$	\$1,970,140 295,521	\$2,006,772 301,016	\$2,378,281 356,742
Overhead (15%) Profit (10%)	197,014	200,677	237,828
Bond (2.5%)	49,254	50,169	59,457
Contingency (10%)	251,193	255,863	303,231
ANTICIPATED CONTRACT COSTS	\$2,763,121	\$2,814,498	\$3,335,539
S&A (5.5%)	\$ 151,972	\$ 154,797	\$ 183,455
CURRENT WORKING ESTIMATE	\$2,915,093	\$2,969,295	\$3,518,994

6.6 ECONOMIC SUMMARY

Table 6-4 below summarizes the economics of installing an EMCS as configured in this study. The total investment, per ECIP guidance, is the current working estimate plus 6% for design costs. The annual maintenance cost is based on 11% of the system hardware costs, per COE EMCS Cost Estimating Guidelines, CEHND-SP-90-244-ED-ME. It assumes the purchase of a service contract from the equipment manufacturer.

TABLE 6-4 SYSTEM ECONOMICS

SYSTEM ECONOMICS	ALTERNATIVE 1 1995 \$	ALTERNATIVE 2 1995 \$	ALTERNATIVE 3 1995 \$
Anticipated Contract Cost (\$)	2,763,121	2,814,498	3,335,539
Total Investment, Per ECIP Guidance (\$)	3,080,881	3,138,166	3,719,127
Annual Savings (MBtu)	182,855	182,855	182,855
First Year Energy Savings (\$)	1,422,972	1,422,972	1,422,972
Annual Maintenance Manhours Savings (\$)	56,820	56,820	56,820
Annual Electrical Demand Savings (\$)	2,653	2,653	2,653
Annual Maintenance Cost (\$)	(50,000)	(50,000)	(50,000)
Total Non-Energy Annual Recurring Savings (\$)	6,820	6,820	6,820
Net First Year Savings (\$)	1,429,792	1,429,272	1,429,272
Simple Payback (years)	2.15	2.19	2.60
Net Discounted Savings (\$)	12,849,270	12,849,270	12,849,270
SIR	4.17	4.09	3.45

6.7 LIFE CYCLE COST ANALYSIS

The Life Cycle Cost Analysis (LCCA) Summary on the following pages was prepared per <u>Energy Conservation Investment Program (ECIP) Guidance</u>, dated 4 November 1992. The uniform present worth (UPW) factors were for industrial users, 3.0% discount rate, and maximum economic life of 10 years, for Census Region 1, which includes New York.

6.8 DD-1391

Form DD 1391 is provided on the pages following the LCCA, at the end of this Section 6.

LIFE CYCLE COST ANALYSIS SUMMARY STUDY: DRUM2
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) LCCID FY95 (92) INSTALLATION & LOCATION: FORT DRUM, NY REGION NOS. 2 CENSUS: 1 PROJECT NO. & TITLE: DACA01-94-D-0033 EMCS PROJECT FISCAL YEAR 1995 DISCRETE PORTION NAME: ALTERNATIVE 1 ANALYSIS DATE: 05-03-95 ECONOMIC LIFE 10 YEARS PREPARED BY: KC 1. INVESTMENT A. CONSTRUCTION COST \$ 2763121. B. SIOH \$ 151972. C. DESIGN COST \$ 165788. 165788. D. TOTAL COST (1A+1B+1C) \$ 3080881. E. SALVAGE VALUE OF EXISTING EQUIPMENT \$ F. PUBLIC UTILITY COMPANY REBATE \$ G. TOTAL INVESTMENT (1D - 1E - 1F) 3080881. 2. ENERGY SAVINGS (+) / COST (-) DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1994 UNIT COST SAVINGS ANNUAL \$ DISCOUNT DISCOUNTED \$/MBTU(1) MBTU/YR(2) SAVINGS(3) FACTOR(4) SAVINGS(5) 7224030. \$ 4347789. \$ 1183695. 9.49 \$ 8.81 \$ 12949. 0. 0. 9.30 p 2653. 8.53 \$ 22630. \$ 12791090. 3. NON ENERGY SAVINGS(+) / COST(-) A. ANNUAL RECURRING (+/-) 6820. (1) DISCOUNT FACTOR (TABLE A) 8.53 \$ 58175. (2) DISCOUNTED SAVING/COST (3A X 3A1) B. NON RECURRING SAVINGS (+) / COSTS (-) SAVINGS(+) YR DISCNT DISCOUNTED COST(-) OC FACTR SAVINGS(+)/ COST(-) OC
(1) (2) (3) ITEM

d. TOTAL \$ 0. 0.

- C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)\$ 58175.
- 4. FIRST YEAR DOLLAR SAVINGS 2N3+3A+(3Bd1/(YRS ECONOMIC LIFE))\$ 1429792.
- 5. SIMPLE PAYBACK PERIOD (1G/4)

2.15 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C)

\$ 12849270.

COST(-)(4)

7. SAVINGS TO INVESTMENT RATIO (SIR) = (6 / 1G) = 4.17 (IF < 1 PROJECT DOES NOT QUALIFY)

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

STUDY: DRUM2
LCCID FY95 (92) INSTALLATION & LOCATION: FORT DRUM, NY REGION NOS. 2 CENSUS: 1 PROJECT NO. & TITLE: DACA01-94-D-0033 EMCS PROJECT FISCAL YEAR 1995 DISCRETE PORTION NAME: ALTERNATIVE 2 ANALYSIS DATE: 05-03-95 ECONOMIC LIFE 10 YEARS PREPARED BY: KC 1. INVESTMENT A. CONSTRUCTION COST \$ 2814498. B. SIOH \$ 154798. C. DESIGN COST \$ 168870. D. TOTAL COST (1A+1B+1C) \$ 3138166. E. SALVAGE VALUE OF EXISTING EQUIPMENT \$ F. PUBLIC UTILITY COMPANY REBATE \$ G. TOTAL INVESTMENT (1D - 1E - 1F) 3138166. 2. ENERGY SAVINGS (+) / COST (-) DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1994 UNIT COST SAVINGS ANNUAL \$ DISCOUNT DISCOUNTED \$/MBTU(1) MBTU/YR(2) SAVINGS(3) FACTOR(4) SAVINGS(5) FUEL \$ 7224030. B. DIST \$ -..

C. RESID \$ 4.25

D. NAT G \$ 6.07

E. COAL \$.00

F. PPG \$.00

M. DEMAND SAVINGS

182855.

2052

0. \$ 0.

\$ 2653.

182855.

\$ 1422972. 9.60 \$ 4347789. \$ 1183695. 10.46 9.49 \$ 12949. 8.81 \$ 0. 9.30 0. 8.53 \$ 22630. \$ 12791090. 3. NON ENERGY SAVINGS(+) / COST(-) \$ 6820. A. ANNUAL RECURRING (+/-) (1) DISCOUNT FACTOR (TABLE A) 8.53 \$ 58175. (2) DISCOUNTED SAVING/COST (3A X 3A1) B. NON RECURRING SAVINGS (+) / COSTS (-) DISCOUNTED SAVINGS(+)/ COST(-)(4) SAVINGS(+) YR DISCNT COST(-) OC FACTR ITEM \$ 0. d. TOTAL C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)\$ 58175. 4. FIRST YEAR DOLLAR SAVINGS 2N3+3A+(3Bd1/(YRS ECONOMIC LIFE))\$ 1429792. 5. SIMPLE PAYBACK PERIOD (1G/4) 2.19 YEARS

\$ 12849270.

4.09

7. SAVINGS TO INVESTMENT RATIO (SIR) = (6 / 1G) =

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C)

(IF < 1 PROJECT DOES NOT QUALIFY)

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LCCID FY95 (92) INSTALLATION & LOCATION: FORT DRUM, NY REGION NOS. 2 CENSUS: 1 PROJECT NO. & TITLE: DACA01-94-D-0033 EMCS PROJECT FISCAL YEAR 1995 DISCRETE PORTION NAME: ALTERNATIVE 3 ANALYSIS DATE: 05-03-95 ECONOMIC LIFE 10 YEARS PREPARED BY: KC 1. INVESTMENT A. CONSTRUCTION COST \$ 3335539. B. SIOH \$ 183455. C. DESIGN COST \$ 200133. D. TOTAL COST (1A+1B+1C) \$ 3719127. E. SALVAGE VALUE OF EXISTING EQUIPMENT S F. PUBLIC UTILITY COMPANY REBATE \$ G. TOTAL INVESTMENT (1D - 1E - 1F) 3719127. 2. ENERGY SAVINGS (+) / COST (-) DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1994 UNIT COST SAVINGS ANNUAL \$ DISCOUNT DISCOUNTED \$/MBTU(1) MBTU/YR(2) SAVINGS(3) FACTOR(4) SAVINGS(5) FUEL 3. NON ENERGY SAVINGS(+) / COST(-) A. ANNUAL RECURRING (+/-) 6820. (1) DISCOUNT FACTOR (TABLE A) 8.53 (2) DISCOUNTED SAVING/COST (3A X 3A1) \$ 58175. B. NON RECURRING SAVINGS (+) / COSTS (-) SAVINGS(+) YR DISCNT
COST(-) OC FACTR
(1) (2) (3) DISCOUNTED SAVINGS(+)/ COST(-)(4) ITEM \$ 0. d. TOTAL 0. C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)\$ 58175. 4. FIRST YEAR DOLLAR SAVINGS 2N3+3A+(3Bd1/(YRS ECONOMIC LIFE))\$ 1429792. 5. SIMPLE PAYBACK PERIOD (1G/4) 2.60 YEARS 6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) \$ 12849270.

3.45

7. SAVINGS TO INVESTMENT RATIO (SIR) = (6 / 1G) =

(IF < 1 PROJECT DOES NOT QUALIFY)

1. COMPONENT ARMY	FY 1997 MILITARY CO	ONSTRU	CTION PROJE	ECT DATA	2. DATE 13 JAN 97
3. INSTALLATION AND LOC Fort Drum, New York	ATION		4. PROJECT TI Installation o Control Syst	f Energy Monit	toring
5. PROGRAM ELEMENT	6. CATEGORY CODE 80000	7. PROJE	ECT NO.	8. PROJECT C	OST (\$000)
	9. COST ES	STIMATES			
1	TEM	U/M	QUANTITY	UNIT COST	COST (\$000)
buildings. Provide computers, Centra Communication Pr Interface, Remote Control Units, Unit and actuators. Re buildings on the exfiber optic (FO) cal	MCS to include 115 PC-based front-end I Operator Station, ocessor and Network Control Units, Auxiliary ary Control Units, sensors, place field hardware in 16 cisting EMCS and retain ole to these buildings. to the 99 additional	LS			3,338
Supporting Facilities: Design Cost (6º Estimated Contract Cos		LS			<u>200</u> 3,538
Contingency (10%)		LS			354
Subtotal					3,892
Supervision, Inspection	and Overhead (5.5%)	LS			214
TOTAL REQUEST					4,106

10. DESCRIPTION OF PROPOSED CONSTRUCTION

The proposed construction includes a new EMCS at Fort Drum to control and monitor systems in 99 new buildings and replace field hardware in the original 16 buildings on the existing EMCS. The new EMCS should consist of PC-based front-end computers communicating to building Remote Control Units, Auxiliary Control Units, and Unitary Control Units, to control and monitor 4,931 points. A new data transmission system, consisting of contractor-installed aerial and underground FO cable shall be provided for all data communication needs to the 99 new buildings. The FO cable to the 16 buildings on the existing EMCS shall be retained and used for the replacement field hardware.

DD FORM 1391

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1 DEC 76

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PAGE NO. 1

1. COMPONENT ARMY	FY 1997 MILITARY CONSTRUCTION PR	OJECT DATA	2. DATE 13 JAN 97
3. INSTALLATION AND LOCAT Fort Drum, New York	TION		
4. PROJECT TITLE Installation of I	Energy Monitoring Control System (EMCS)	5. PROJECT N	UMBER

11. REQUIREMENT

PROJECT:

Install a new EMCS to include 115 additional buildings. Provide PC-based front-end computers, Central Operator Station, Communication Processor and Network Interface, Remote Control Units, Auxiliary Control Units, Unitary Control Units, sensors, and actuators. Replace field hardware in 165 buildings on the existing EMCS and retain fiber optic (FO) cable to these buildings. Provide FO cable to the 99 additional buildings. Provide two additional EMCS operators for the EMCS.

REQUIREMENT:

This project is required to reduce the fuel oil consumption, LPG consumption, electrical consumption, and electrical demand of HVAC equipment, boilers, chillers, and electric domestic hot water heaters through EMCS control technology.

CURRENT SITUATION:

Fort Drum has an existing EMCS in 16 buildings. The final construction and acceptance of this EMCS was completed in the summer of 1991. The EMCS configuration includes dual Digital Equipment Corporation (DEC) MicroVax 3100 minicomputers, three DEC VaxStation 3100's with 19" color monitors, plus peripherals and a failover controller. Six FO data transmission cables facilitate the communications from the master control room to the buildings.

Discussions with the EMCS operators at Fort Drum regarding the existing EMCS indicated the system was operational and was providing them significant utility savings (especially through electrical demand limiting). The discussions also revealed some problems and defects associated with the existing EMCS.

DD FORM 1391c

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1. COMPONENT ARMY	FY 1997 MILITARY CONSTRUCTION	N PROJECT DATA	2. DATE 13 JAN 97
3. INSTALLATION AND LOC Fort Drum, New York	ATION		
4. PROJECT TITLE Installation of Energy	y Monitoring Control System (EMCS)	5. PROJECT N	UMBER

IMPACT IF NOT PROVIDED:

If this project is not funded, a reduction of 195,777 MBtu/yr cannot be achieved. Excessive amounts of fuel oil, LPG, natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.

ADDITIONAL:

This project complies with the scope and design criteria of the "Energy Conservation Investment Program (ECIP) Guidance". The project has a Savings to Investment Ratio (SIR) of 3.5 and a simple payback of 2.6 years. The implementation of this project will provide an annual energy savings of 195,777 MBtu and an annual total dollar savings of \$1,037,666.

Project validation will be through the use of electric and gas meters on the existing utilities to record consumption basewide.

DD FORM 1391c 1 DEC 76 PREVIOUS EDITIONS MAY BE USED INTERNALLY

TRI-SERVICE MILITARY CONSTRUCTION PROGRAM (MCP) INDEXES FOR FY 94 THROUGH FY 99 PROGRAM

DEC	1604 1671 1736	1788 1832 1876	1919 1963	2005 2050 2095	2142
NOV	1599 1665 1731	1785 1829 1873	1916	2003 2047 2092	2130
OCT	1594 1659 1727	1781 1825 1869	1912	1999 2043 2033	2134
SEP	1583 1652 1720	1775 1821 1865	1906	1995 2039 2033	2129
AUG	1583 1646 1714	1770 1816 1860	1903	1990 2034 2079	2125
JUL	1573 1640 1707	1764 1812 1856	1399 1943	1986 2030 2074	2120
N N	1572 1634 1700	1759 1807 1852	1895 1939	1982 2025 2070	2115
MAY	1567 1627 1693	1753 1803 1847	1890	1977 2021 2065	2111
APR	1562 1620 1686	1748	1886 1929	19/3 2016 2061	2106
MAR	1559 1616 1683	1745	1884	19/1 2014 2059	2104
FEB	1556 1613 1680	1743	1882 1925	1969 2012 2056	2101
NAN	1553 1610 1676	1740	1880 1923	1967 2010 2054	2091
YEAR	1988 1989 1990	1991	1994 1995	1996 1997 1998	1999

- 1. Use 2.2% per fiscal year for projection beyond PY 1999.
- 2. Tri-Service MCP Index Base = 1000 = 1 Oct 79
- Monthly indexes derived by CEMRD-ED-CV from quarterly indexes in Table IV, CEMP-EC, 11 MAR 93. က

MCP	Index	1934	2079	2083	2129	
		May 95	Aug 98	Sep 98	Sep 99	
		Submittal Date	Bid Opening Date	Contract Award Date	Midpoint: of Construction	

Cost Growth Factor = 2129/1934 = 1.100827

CEMRD-ED-CV March 1993

6-14

SECTION 7.0

CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

- Of the 115 buildings evaluated, 110 buildings would provide an SIR greater than 1.0, if included in the EMCS, under Alternatives 2 or 3.
- The estimated construction cost for Alternative 3, to include the new buildings and upgrade the existing buildings was \$3,335,539, only \$521,041 more than Alternative 2.
- Including those HVAC and utility systems which have sufficient cost avoidance to justify connection to the EMCS, resulted in controlling and monitoring 4,931 points.

7.2 RECOMMENDATIONS

- It is recommended that an Energy Conservation Investment Program (ECIP) project be developed to provide a new EMCS at Fort Drum to control and monitor systems in 99 buildings without an existing control system, as evaluated in this study, plus replace the existing hardware in the 16 buildings connected to the existing Tracer system. Alternative 3 would allow Fort Drum to have a single EMCS. The benefits of having a single EMCS are in the operation and maintenance of one EMCS, instead of two parallel EMCS. The EMCS should consist of new PC-based front-end computers communicating to building Remote Control Units (RCUs), Auxiliary Control Units (ACUs), and Unitary Control Units (UCUs), to control and monitor 4,931 points.
- It is recommended that all data transmission media be FO cable. A new data transmission system, consisting of contractor-installed aerial and underground FO cable is recommended for all data communication needs to the 99 buildings without an existing control system, recommended for the EMCS. It is also recommended that the existing FO DTM in the 99 buildings without an existing control system.

It is recommended that Fort Drum hire two additional EMCS operators for the EMCS.

APPENDIX A SCOPE OF WORK AND CONTRACT DOCUMENTS

GENERAL SCOPE OF WORK

FOR

FEASIBILITY STUDY FOR EXPANSION OF ENERGY MONITORING AND CONTROL SYSTEM (EMCS) FORT DRUM, NEW YORK

SCOPE OF WORK FEASIBILITY STUDY FOR EMCS EXPANSION, FORT DRUM, NEW YORK

TABLE OF CONTENTS

1.0	BRIEF DESCRIPTION OF WORK
2.0	GENERAL
3.0	PROJECT MANAGEMENT
4.0	SERVICES AND MATERIALS
5.0	PROJECT DOCUMENTATION
5.1 5.2 5.3	ECIP PROJECTS NON-ECIP PROJECTS NONFEASIBLE ECOS
6.0	DETAILED SCOPE OF WORK
7.0	WORK TO BE ACCOMPLISHED
7.1 7.2 7.3 7.4 7.5	REVIEW DATA FOR EXISTING EMCS PERFORM A LIMITED SITE SURVEY EVALUATE SELECTED BUILDINGS PROVIDE PROGRAMMING OR IMPLEMENTATION DOCUMENTATION SUBMITTALS, PRESENTATIONS, AND REVIEWS
	ANNEXES
Α	DETAILED SCOPE OF WORK
В	REQUIRED DD FORM 1391 DATA
С	EXECUTIVE SUMMARY GUIDELINE

- 1.0 BRIEF DESCRIPTION OF WORK: The Architect-Engineer (AE) shall:
- 1.1 Review for general information the available design, construction, and operating data for the existing Energy Monitoring and Control System (EMCS).
- 1.2 Perform a limited site survey of selected buildings or facilities to verify construction features, electrical and mechanical equipment, occupancy, and mode of operation for energy analysis.
- 1.3 Evaluate EMCS applications programs (software) for specific buildings or facilities to determine their energy savings potential and economic feasibility for connection of the buildings/facilities to an EMCS.
- 1.4 Provide complete programming or implementation documentation for all recommended projects.
- 1.5 Prepare a comprehensive report to document the work performed, the results, and the recommendations.
- 2.0 GENERAL:
- 2.1 The existing EMCS was provided by TRANE. The system uses dial-up telephone communications for data transmission between buildings and the central PC computer. This study is intended to evaluate selected buildings and facilities for connection to an EMCS.
- 2.2 The information and analysis outlined herein are considered to be minimum essentials for adequate performance of this study.
- 2.3 For the purposes of this scope of work, an Energy Conservation Opportunity (ECO) is defined as the application of one or more EMCS energy conservation programs (applications software) within a particular building or facility. A project is defined as the connection of one or more buildings/facilities to the EMCS.
- The AE shall ensure that all ECOs which will reduce the energy consumption or cost of operation of the installation have been considered and documented. A list of EMCS applications programs (software) to be used when evaluating specific buildings or facilities is included in TM5-815-2, "Energy Monitoring and Control Systems (EMCS)." Some of the applications programs listed in TM5-815-2 may not be applicable to the specific building or facility being evaluated; in such cases, a statement to that effect is all that is required.
- 2.5 The study shall include the energy consuming buildings or facilities listed in the Detailed Scope of Work, Annex A. Field work and calculations may be reduced somewhat by building repetition.

- Computer modeling will be used to determine the energy savings of ECOs for typical 2.6 buildings. The results of these calculations may be applied to buildings which are similar to the typical buildings. To be considered similar, a building must be essentially the same as the typical building in size, floor plan, mechanical equipment, type of construction, and occupancy. If a building is identical to a typical building in all respects except that the occupancy has been changed (e.g., a barracks converted into offices), the building should not be considered similar. In some cases, differences in physical orientation will not be a significant factor. Modeling will be done using a professionally recognized and proven computer program or programs that integrate architectural features with air-conditioning, heating, lighting, and other energyproducing or consuming systems. These programs will be capable of simulating the features, systems, and thermal loads of the building under study. The program will use established weather data files and may perform calculations on a true hour-byhour basis or may condense the weather files and the number of calculations into several "typical" days per month. The Detailed Scope of work, Annex A, lists programs that are acceptable to the Contracting Officer. If the AE desires to use a different program, it must be submitted for approval with a sample run, an explanation of all input and output data, and a summary of program methodology and energy evaluation capabilities. The AE may use spread-sheet or manual calculations based on the standardized energy savings calculations presented in CR82-030 of Naval Facilities Engineering Command document number UG-0010, "User Guide for Single Building Controllers."
- 2.7 Cost estimates for all EMCS hardware, software, data transmission media (DTM), testing, and other required EMCS services shall be made using CEHND-SP-90-244-ED-ME, "Energy Monitoring and Control Systems, Large and Medium Configurations, Cost Estimating Guidelines." Quotations from the manufacturer of the existing system will be acceptable.
- 2.8 The most recent "Energy Conservation Investment Program (ECIP) Guidance" establishes criteria for ECIP projects and shall be used for performing the economic analyses of all ECOs and projects. Construction cost escalation for DD Form 1391 submission shall be calculated using the guidelines contained in AR 415-17 and the latest Tri-Service MCP index. The Tri-Service MCP index, when updated, is contained in the latest applicable edition of the Engineer Improvement Recommendation System (EIRS) Bulletin.
- 2.9 Energy conservation opportunities determine to be technically and economically feasible shall be developed into projects acceptable to installation personnel. This may involve combining similar buildings/projects into larger packages which will qualify for ECIP or MCA funding, and determining, in coordination with installation personnel, the appropriate packaging and implementation approach for all feasible ECOs.
- 2.10 Projects which qualify for ECIP funding shall be identified, separately listed, and prioritized by the Savings-to-Investment Ratios (SIR).
- 2.11 All feasible non-ECIP projects shall be ranked in order of highest to lowest SIR.

3.0 PROJECT MANAGEMENT:

- Project Managers The AE shall designate a project manager to serve as a point of contact and liaison for work required under this contract. Upon award of this contract, the individual shall be immediately designated in writing. The AE's designated project manager shall be approved by the Contracting Officer prior to commencement of work. This designated individual shall be responsible for coordination of work required under this contract. The Contracting Officer will designate a project manager to serve as the Government's point of contact and liaison for all work under this contract. This individual will be the Government's representative.
- Installation Assistance The Commanding Officer at each point of installation will designate an individual who will serve as the point of contact for obtaining information and assisting in establishing contacts with the proper individuals and organizations as necessary to accomplish the work required under this contract.
- 3.3 <u>Public Disclosures</u> The AE shall make no public announcements or disclosures relative to information contained or developed in this contract, except as authorized by the Contracting Officer.
- Meetings Meetings will be scheduled whenever requested by the AE or the Contracting Officer for the resolution of questions or problems encountered in the performance of work. The AE and/or the designated representative(s) shall be required to attend and participate in all meetings pertinent to the work required under this contract, as directed by the Contracting Officer. These meetings, if necessary, are in addition to the presentation and review conferences. The AE's contract will be modified to include labor and costs to attend additionally scheduled meetings.
- 3.5 <u>Site Visits, Inspections, and Investigations</u> The AE shall visit and inspect/investigate the site of the project as necessary and required during the preparation and accomplishment of the work.

3.6 Records

- 3.6.1 The AE shall provide a record of all significant conferences, meetings, discussions, verbal directions, telephone conversations, etc., with Government representative(s) relative to this contract in which the AE and/ or designated representative(s) thereof participated. These records shall be dated and shall identify the contract number, and modification number if applicable, participating personnel, subject discussed, and conclusions reached. The AE shall forward to the Contracting Officer within ten calendar days, a reproducible copy of the records.
- 3.6.2 The AE shall provide a record of requests for and/or receipt of Government-furnished material, data, documents, information, etc., which if not furnished in a timely manner, would significantly impair the normal progression of the work under this contract. The records shall be dated and shall identify the contract number and modification number, if applicable. The AE shall forward to the Contracting Officer, within ten

calendar days, a reproducible copy of the record of request or receipt of material.

- Interviews The AE and the Government's representative shall conduct entry and exit interviews with the Director of Engineering and Housing before starting work at the installation and after completion of the field work. The Government's representative shall schedule the interviews at least one week in advance.
- 3.7.1 Entry The entry interview shall thoroughly describe the intended procedures for the survey and shall be conducted prior to commencing work at the facility. As a minimum, the interview shall cover the following points:
 - A. Schedules.
 - B. Names of energy analysts who will be conducting the site survey.
 - C. Proposed working hours.
 - D. Support requirements from the Director of Engineering and Housing.
- 3.7.2 <u>Exit</u> The exit interview shall include a thorough briefing describing the items surveyed and probably areas of energy conservation. The interview shall also solicit input and advice from the Director of Engineering and Housing.
- 4.0 SERVICES AND MATERIALS: All services, materials (except those specifically enumerated to be furnished by the Government), labor, superintendence and travel necessary to perform the work and render the data required under this contract are included in the lump sum price of the contract.
- 5.0 PROJECT DOCUMENTATION: All energy conservation opportunities or projects which the AE has considered shall be included in one of the following categories and reported in the report as such.
- 5.1 <u>ECIP Projects</u> To qualify as an ECIP project, the ECO or project must have a construction cost estimate greater than \$300,000, a SIR greater than one, and a simple payback period of less than eight years. The AE shall check with the installation for guidance. The overall project and each discrete part of the project shall have a SIR greater than one. For all projects meeting the above criteria, complete programming documentation will be required. Programming documentation shall consist of a DD Form 1391, life cycle cost analysis (LCCA) summary sheet(s) (with necessary backup data to verify the numbers presented), and a project development brochure (PDB). A LCCA summary sheet shall be developed for each ECO and for the overall project when more than one building are combined.
- Non-ECIP Projects Projects which normally do not meet ECIP criteria, but which have an overall SIR greater than one shall be documented. The LCCA summary sheet shall be completed for all ECOs or projects. Each shall be analyzed to determine if it is feasible even if it does not meet ECIP criteria. These ECOs or projects may not meet the nonenergy qualification test. For ECOs or projects which meet this criteria,

the LCCA summary sheet, completely filled out, with all the necessary backup data to verify the numbers presented, a complete description of the project, and the simple payback period shall be included in the report. Additionally, these projects shall have the necessary documentation prepared, in accordance with the requirements of the Government's representative, for one of the following categories:

- A. Quick Return on Investment Program (QRIP): This program is for projects which have a total cost not over \$100,000 and a simple payback period of two years or less.
- B. OSD Productivity Investment Funding (OSD PIF): This program is for projects which have a total cost of more than \$100,000 and a simple payback period of four years or less.
- C. Productivity Enhancing Capital Investment Program (PECIP): This program is for projects which have a total cost of more than \$3,000 and a simple payback period of four years or less.

The above programs are all described in detail in AR 5-4, Change No. 1.

- D. Regular Military Construction Army (MCA) Program: This program is for projects which have a total cost greater than \$300,000 and a simple payback period of eight to twenty-five years.
- E. Low Cost/No Cost Projects: These are projects which the Director of Engineering and Housing can perform using his resources.
- 5.3 Nonfeasible ECOs All buildings/facilities which the AE has considered but which are not feasible for connection to the existing EMCS shall be documented in the report, with reasons and justifications showing why they were rejected.
- 6.0 DETAILED SCOPE OF WORK: The detailed Scope of Work is contained in Annex A.
- 7.0 WORK TO BE ACCOMPLISHED:
- Review Data for Existing EMCS The AE shall review for general information the construction drawings and specifications and the manufacturer's drawings and operations and maintenance manuals for the existing EMCS. This review should acquaint the AE with the details of the hardware and software used in the existing system. Much of the information the AE may need to perform his evaluations will be contained in this data.
- Perform a Limited Site Survey The AE shall determine, based on information provided by the installation, which buildings are "typical" and which are "similar," as defined in paragraph 2.5. A limited field survey of all buildings listed in the Detailed Scope of Work shall be conducted to verify and/or adjust the list of "typical" and "similar" buildings. A detailed field investigation will then be made of all "typical"

buildings using the outline provided in the Detailed Scope of Work. This will include noting and reporting on malfunctioning or inoperative equipment or controls. The AE shall document his site survey on forms developed for the survey, or on the standard forms of HNDSP84-ED-ME, "Preliminary Survey and Feasibility Study for Energy Monitoring and Control Systems," and submit these completed forms as part of the report. Testing is not required.

- Evaluate Selected Buildings For each building/facility listed in Annex A, the AE shall determine which applications programs are feasible for that building. He shall then determine the feasibility of connecting each building (group of buildings) to the existing EMCS. These ECOs and projects shall be analyzed in detail to determine feasibility. SIRs shall be determined using current ECIP guidance. The AE shall provide all data and calculations needed to support these analyses. All assumptions shall be clearly stated. Calculations shall be prepared showing how all numbers in the ECO were figured. Calculations shall be an orderly, step-by-step progression from the first assumption to the final number. Descriptions of the products, manufacturers' catalog cuts, pertinent drawings or sketches, and input/output (I/) summary sheets shall also be included. A LCCA summary sheet shall be prepared for each ECO or project, and shall be included as part of the supporting data. Provide a LCCID summary for each recommended project developed.
- 7.4 <u>Provide Programming or Implementation Documentation</u> For projects developed during this study, complete programming or implementation documentation shall be prepared by the AE.
- Programming Documentation for projects which meet ECIP criteria and which the installation wants to submit as an ECIP project, complete programming documentation shall be prepared. Complete programming documentation consists of DD For, 1391, Project Development Brochure (PDB), and supporting data. These forms shall be separate from the narrative report. They shall be bound similarly to the final report in a manner which will facilitate repeated disassembly and reassembly. One 1391 and one PDB shall be furnished for this study.
- 7.4.1.1 Military Construction Project Data (DD Form 1391) These documents shall be prepared in accordance with AR 415-15 and the supplemental requirements in Annex B. A complete DD Form 1391 shall be prepared for each project. The form shall include a statement that the project results from an EEAP study. Documents shall be complete as required for submission to higher DA headquarters. These programming documents will require review and signatures by the proper installation personnel. All documents shall be completed except for the required signatures.
- 7.4.1.2 Project Development Brochure (PDB) Preparation of the PDB requires the AE to delineate the functional requirements of the project as related to the specific site. The AE shall prepare PDBs in accordance with AR 415-20 and TM5-800-3. Most projects will not require all the forms and checklists included in the Technical Manual (TM). Only that information needed for the project shall be included. The PDB-I format described in the TM shall be used for whatever information is needed.

- Implementation Documentation For feasible projects or ECOs which do not meet 7.4.2 ECIP criteria, implementation documentation shall be prepared. Each feasible project or ECO shall be individually packaged, fully documented, and included as s separate section in the volume containing the programming documentation. Each project or ECO shall have a complete description of work to be done, economic justifications, sketches, I/O summary sheets, and other backup data included as a section of the report. The documentation required will be as determined by the Government's representative. Documentation required will be in the categories listed in paragraph 5.2. For the QRIP, OSD PIF, and PECIP projects, documentation shall be prepared in accordance with the requirements of AR 5-4, change No. 1. A sample implementation document, consisting of a DA Form 5108-R, sketches and manufacturers' data, and a LCCA summary sheet shall be submitted for review and approval. This sample shall be submitted with the interim submittal; and it shall be approved before any other implementation documents are prepared. To the degree possible, the project selected for the sample submission shall be typical of the majority of subsequent projects to be submitted. The sample shall consist of complete implementation documents, with primary emphasis on format and manner of presentation, rather than precise accuracy of cost estimates and energy savings data. For MCA projects, the documentation required shall be in accordance with paragraph 7.4.1. For low cost/no cost projects which the Director of engineering and Housing personnel can perform, the following information shall be provided:
 - A. Brief description of the project.
 - B. Brief description of the reasons for the modification.
 - C. Specific instructions for performing the modification.
 - D. Estimated dollar and energy savings per year.
 - E. Estimated manhours and labor and materials costs. Costs shall be calculated for the current year and so marked. Manhours shall be listed by trade.

Separate sheets for each project, showing the above information, shall be prepared and included in the report.

Submittals, Presentations, and Reviews The work accomplished shall be fully documented by a comprehensive report. The report shall have a table of contents and be indexed. Tabs and dividers shall clearly and distinctly divide sections, subsections, and appendices. All pages shall be numbered. The AE shall give a formal presentation of all but the final submittal to installation, command, and other Government personnel. The AE shall prepare slides or view graphs showing the results of the study to date for his presentation. During the presentation, the personnel in attendance shall be given ample opportunity to ask questions and discuss any changes deemed necessary to the study. A review conference will be conducted the same day, following the presentation. Each comment presented at the review conference will be discussed and resolved, or action items assigned. The AE shall provide the comments from all reviewers and written notification of the action taken

on each comment, to all reviewing agencies, within three weeks after the review meeting. It is anticipated that each presentation and review conference will require approximately one working day. The presentation and review conferences will be at the installation of the date(s) agreeable to the Director of Engineering and Housing, the AE, and the Government's representative. The Contracting Officer may require a resubmittal of any document(s), if such document(s) are not approved because they are determined by the Contracting Officer to be inadequate for the intended purpose.

- Interim Submittal An interim report shall be submitted for review after the field 7.5.1 survey has been completed and an analysis has been performed on all of the ECOs. The report shall indicate the work which has been accomplished to date, illustrate the methods and justifications of the approaches taken, and contain a plan of the work remaining to complete the study. I/O summary sheets, and calculations showing energy and dollar savings and SIRs of all ECOs/projects, shall be included. The simple payback period of all ECOs/projects shall be calculated and shown in the report. The AE shall submit the Scope of Work andy any modifications to the Scope of Work as an appendix to the report. a narrative summary describing the work and results to date shall be a part of this submittal. During the review period, the Government's representative shall coordinate with the Director of Engineering and Housing and provide the AE with direction for packaging or combining ECOs for programming purposes and also indicate the fiscal year for which the programming or implementation documentation shall be prepared. The survey forms completed during this audit shall be submitted with this report. The survey forms only may be submitted in final form with this submittal. They should be clearly marked at the time of submission that they are to be retained. They shall be bound in a standard threering binder which will allow repeated disassembly and reassembly of the material contained within.
- Prefinal Submittal The AE shall prepare and submit the prefinal report when all 7.5.2 sections of the report are complete. The AE shall submit the Scope of Work as an The report shall contain a narrative summary of appendix to the submittal. conclusions and recommendations, including a summary of findings on malfunctioning or inoperative equipment for each building proposed for connection to the existing EMCS, together with all raw and supporting data, methods used, and sources of information. The report shall integrate all aspects of the study. The report shall list the recommended projects in order of descending SIR. The synergistic effects of all of the applications programs proposed for any particular building shall have been determined and the results of the original calculations adjusted accordingly. Completed programming and implementation documents for the recommended projects shall be included. The programming and implementation documents shall be ready for review and signature by the installation commander. The prefinal report, separately bound Executive Summary, and all appendices shall be bound in standard three-ring binders which will allow repeated disassembly and reassembly. The prefinal submittal shall be arranged to include the following:
 - A. A separately bound Executive Summary, to give a brief overview of what was accomplished and the results of this study, using graphs, tables, and charts as much as possible.

- B. The narrative report, containing a copy of the Executive Summary at the beginning of the volume, and describing in detail what was accomplished and the results of this study.
- C. Appendices, to include the detailed calculations and all backup material.
- D. The programming and implementation documentation.

A list of all projects and ECOs developed during this study shall be included in the Executive Summary, and shall include the following data from the LCCA summary sheet: The cost (construction plus SIOH); the annual energy savings (type and amount); the annual dollar savings; the SIR; the simple payback period; and the analysis date. For all programmed projects, also include the year in which it is programmed and the programmed year cost.

Final Submittal Any revisions or corrections resulting from comments made during the review of the prefinal report or during the presentation and review conference shall be incorporated into the final report. These revisions or corrections may be in the form of replacement pages, which may be inserted in the prefinal report, or complete new volumes. Pen and ink changes or errata sheets will not be acceptable. If replacement pages are to be issued, it shall be clearly stated with the prefinal submittal that the submitted documents will be changed only to comply with the comments made during the prefinal conference, and that the volumes issued at the time of the prefinal submittal should be retained. Failure to do so will require resubmission of complete volumes. If new volumes are submitted, they shall be in standard three-ring binders and shall contain all the information presented in the prefinal report, with any necessary changes made. Detailed instructions of what to do with the replacement pages should be securely attached to the replacement pages.

ANNEX A

DETAILED SCOPE OF WORK

1. LOCATION

A. General description. The Architect Engineer (AE) shall furnish all services, materials, supplies, labor, equipment, investigations, studies, and travel as required in connection with the feasibility study for the below identified project in accordance with the contract and all furnished instructions:

INSTALLATION

DESCRIPTION

Fort Drum, NY

Expansion of Existing Emcs

- B. The project consists of studying the feasibility of including buildings listed to the existing EMCS system. The buildings to be included are listed at the end of this Detailed Scope of Work.
- 2. AUTHORIZATION (Not Required)

3. STUDY INSTRUCTIONS

If the Design Manuals, Guide Specifications, and/or Project Engineering Instructions do not cover a specific condition in question, the AE shall contact the Contracting Officer before proceeding. If there is a conflict in Engineering Instructions or other reference data, such questions or conflicts should be brought to the attention of the Contracting Officer before proceeding.

4. INSTALLATION REPRESENTATIVE

The installation representative for this contract will be Mr. Steve Rowley, Energy Manager.

5. COMPLETION SCHEDULE

The following schedule shall be used as a guide in approving payments on this contract. The interim report for shall be due not later than 180 days after Notice to Proceed. The prefinal report shall be due not later than 45 days after the interim report review conference. The final report shall be due not later than 30 days after the prefinal review conference.

- (3) CEGS 13945 Multi-Building Expansion of Energy Monitoring and Control Systems
- (4) CEGS 16795 Fiber Optics Data Transmission System
- H. "Site Survey Procedures for EMCS" HNDSP86-188-ED-ME"
- I. "User Guide for single building Controllers UG-0010"
- J. "EMCS Cost Estimating Guidelines" HNDSP90-244-ED-ME
- K. Previous studies related to application of EMCS at this site (where applicable)

12. SUBMITTAL REQUIREMENTS

COPIES REQUIRED

<u>ORGANIZATION</u>	(Correspondence); Interim; Final and Prefinal Review	Executive Summary, Only
10th Mountain Division (LI) and F 85 First Street West Fort Drum, NY 13602-5097 Attn: AFZS-EH-OM, Mr. Steve Ro Field Survey - 1 Copy Computer Simulation - 1 Cop	wley	
Norfolk District 803 Front Street Norfolk, VA 23510 Attn: CENAO-EN-MC, Jim Kendal	1	
U.S. Army Engineer Division, Hunders 4930 Corporate Drive, Suite B Huntsville, AL 35805 Attn: CEHND-ED-ME	atsville 1	
Headquarters, Forces Command Energy Office, Building 200 Ft. McPherson, Ga 30330-6000 Attn: FCEN-RDF, Mr. Naresh Kapi	ır	1
U.S. Army Engineer District, Mobil Post Office Box 2288 109 St. Joseph Street Mobile, AL 36602 Attn: CESAM-EN-CC, Anthony Ba		1

CONFIRMATION NOTICE

Confirmation No. 1

EMC #P13F-030

DATE:

19 August 1994

PROJECT:

FY 94/95 ECIP AND EEAP STUDY FOR BASEWIDE EMCS

FORT DRUM, NEW YORK

NOTES

PREPARED BY: Carl E. Lundstrom, EMC Engineers, Inc.

DATE OF

CONFERENCE: 16 August 1994

PLACE OF

CONFERENCE: Building T-400, Ft. Drum, NY

SUBJECT:

UMCS Study Meeting

ATTENDEES:

Jim Kendall, Norfolk District Corps of Engineers (804)-441-7403

Steve Rowley, Energy Manager, O&M DPW, Ft. Drum 315-772-5433

Thomas Ferguson, Chief, Mech. Branch, O&M DPW, Ft. Drum 315-772-4947 Glen Thompson, Foreman, Controls Group, O&M DPW, Ft. Drum 315-772-5388 Joe Ogiba, Telemetry Systems Manager, O&M DPW, Ft. Drum 315-772-3322

Carl E. Lundstrom, Proj. Manager, EMC Engineers, Inc. (404) 642-1864

The following is a summary of the items discussed during the EMCS meeting at Ft. Drum, NY, on 16 August 1994.

- 1. The old Post is W.W. II era. Some renovations have been performed on exteriors and furnaces, and some facilities are new. The old Post is heated with fuel oil.
- 2. The new Post, built in the 1980's, has new major buildings and family housing. The new Post is heated with HTHW.
- The new Post and the old Post have no EMCS, except for a few buildings.
- 4. The four major building types on the new Post are as follows:
 - Barracks
 - Headquarters
 - Vehicle Maintenance
 - Mess Halls

- 5. The one-of-a-kind buildings include the following:
 - Youth Activity
 - Commissary
 - PX
 - Gymnasium
 - Clinic
 - SMA, Maintenance Shops.
- Mr. Glen Thompson, Foreman, Ft. Drum Controls Group, discussed issues concerning the TRANE Tracer Program and Scientific Atlanta; Mr. Joe Ogiba, Ft. Drum, Telemetry Systems Manager, discussed issues concerning Bristol Babcock.
- 7. In 1985, Scientific Atlanta FM radio control was installed in the old Barracks. The EMCS study should include recommendations regarding interfacing the existing radio control with the EMCS.
- 8. The TRANE Tracer EMCS was installed as a building control system, basically for the NAF building. The TRANE Tracer EMCS is currently being considered for the following additional buildings:
 - Commissary
 - PX
 - Youth Activity
 - Bowling Alley.

The TRANE Tracer EMCS is being monitored at the heat shop via dial-up modems and PC. Some buildings have been added through construction and some through O&M work.

- 9. The following two EMCS options should be reviewed in the EMCS study:
 - (1) Two systems: The existing TRANE Tracer EMCS and a new EMCS system.
 - (2) One system: Replace the TRANE Tracer EMCS, with one new system and a new buildings.
- 10. It is the intention of Ft. Drum Management to retain Bristol Babcock SCADA for various utility applications.
- 11. Ft. Drum will install microprocessor-based Fire-Eye remote monitoring for boilers.
- 12. Inputs from the Bristol Babcock SCADA to the heat shop should be included for the EMCS for electrical substation demand monitoring.

- 13. Most of the Post has electric meters. Some buildings on the old Post need meters. Electric and HTHW meters should be added to the EMCS, per Ft. Drum.
- 14. The possibility of utilizing BACNET for the EMCS should be addressed in the EMCS study.
- 15. Component upgrades being considered are as follows:
 - Heating systems are undersized.
 - Return air should be included, to facilitate building warm-up.
 - The cost should be included for return air and controls for systems with 100% outside air.
 - The cost should be included for supplemental heating.
- 16. The possibility of using CO₂ to control ventilation should be reviewed in the EMCS study.
- 17. The operation and maintenance of the EMCS should be addressed.
- 18. Ft. Drum will provide the following building lists:
 - Buildings where return air needs to be added
 - Buildings which require additional heating.
- 19. Budget (rough) estimates will be provided for return air modifications and additional heating system modifications.
- 20. Extrapolation of energy savings calculations, building-to-building by square footage, is acceptable, due to the fact that buildings are very similar.

Carl E. Lundstrom, P.E.

If any portion of this confirmation notice is incorrect, please notify us immediately. If correspondence is not received to the contrary within 14 days, it will be assumed that the decisions and conclusion, and status outlined in this confirmation notice, are correct.

RESPONSES TO REVIEW COMMENTS From Robert S. Woodruff, Dated 7 August 1995

- 1. During the course of the study, Steve Rowley removed several buildings from the original list. The major reason for the changes was the inadvertent inclusion of electric substations and demos. A few buildings were omitted due to incomplete information (per Steve Rowley). They will be included in the final submittal.
- 2. The electrical rate was approximated from the actual billing data provided by Steve Rowley. Later, the approximations were verified with the actual contract rate (within approximately \$0.003 Per kWh).
- 3. The table incorrectly displayed cost rather than therms. The correction has been made.
- 4. The difference in maintenance cost between a new DDC system and the existing system is minimal. EMCS maintenance contracts frequently decrease as existing equipment ages, because replacement costs decrease. Also, in-house maintenance resources will stay constant regardless of the system chosen (it is unlikely there would be an increase or reduction in staff).
- 5. Duty cycling was not included in the study. The description of the function was included as a general reference.
- 6. Those buildings that have economizers are controlled by dry-bulb temperature sensors.
- 7. Per Steve Rowley's request, we have changed the annual maintenance costs to using in-house labor equal to the annual manhours savings (\$56,820). The net result is zero labor savings.
- 8. The title has been change to read "Function and Manpower Savings" (see enclosed).

10:	Army Corps o Norfolk Dist	ricu		
PRO	JECT: Expansi	on of RMCS Year: Line No.:	TCOM	
		nterim Report		
935 O.	Drawing No. Or Par. Mo.	COMPAGIA	Review Action	
	Scope of Work	On page 2-1 paragraph 2.2 states that 114 buildings were analyzed. The Scope of Work on page 1-1 indicates that 130 buildings are to be studied. Please explain this difference.		
•	Energy Rate	The \$ 0.0652 per kWh seems very high. Please verify this rate.		
•	Nat. Gas Consump.	The chart on page 2-18 does not agree with the data presented in Table 2-6 on page 2-17.		
•	Economic Summary	The Table on page 6-6 indicates that the maintenance cost of all three alternatives is the maintenance cost of all three alternatives the old same. Because Alternatives 1 and 2 involve the old system the maintenance costs of these alternatives would logically be higher than the maintenance cost of a new system.		
i.	Appendix B. Page B-1	The description of Duty Cycling does not take into account how make-up air is provided where continuous exhaust systems are required.		
i.	Appendix B. Page B-3	Is the economizer to be used controled operated by dry bulb temperatures or enthalpy?		
7.	Appendix D. Page Page D-20	Is there any scientific or practical basis for the manpower savings indicated in this table ?		
â.	Appendix E. Page E-1	Under the System Function Descriptions there is a listing for Manhours. This is not a system function		
		To: William CENTER Y04-552-6759 (FAC)		
		FM: JIM KENDALL, COE NORFOLK DISTAND BOY-YYI-7403	c 7	
		THE FORT DRUM BEAD STUDY		
		1. PLEASE REVIEW		

FOCT		To: Army Corps of Engineers FROM: (Section): EN-DM (Reviewer): Robert S. Woodruff				
	JECT: Expans: LION: Ft. Dr		ne Item			
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tem Ko.	Drawing No. Or Par. No.	COMPLUE	Review Action			
	Scope of Work	On page 2-1 paragraph 2.2 states that 114 buildings were analyzed. The Scope of Work on page 1-1 indicates that 130 buildings are to be studied. Please explain this difference.				
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6.	Appendix B. Page B-3	Is the economizer to be used controled operated by dry bulb temperatures or enthalpy ?				
7.	Appendix D. Page Page D-20	Is there any scientific or practical basis for manpower savings indicated in this table ?				
â.	Appendix E. Page E-1	Under the System Function Descriptions there is listing for Manhours. This is not a system funct	\			
		To: WILLIAM CENTER 404-552-6739 CF				
		FM: JIM KENDALL, COE NORFOLK DIST BOY-YYI-7YOS	NICT			
		SUBUL EXTREMELY LATE Comments FOR				
		1. PLEASE REVIEW				
		2. CALL IT YOU HAVE ANY GUESTIONS.				

RESPONSES TO REVIEW COMMENTS From Robert S. Woodruff, Dated 7 August 1995

- 1. During the course of the study, Steve Rowley removed several buildings from the original list. The major reason for the changes was the inadvertent inclusion of electric substations and demos. A few buildings were omitted due to incomplete information (per Steve Rowley). They will be included in the final submittal.
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APPENDIX B EMCS APPLICATION PROGRAMS

APPENDIX B

EMCS APPLICATION PROGRAMS

This appendix contains descriptions of the EMCS application programs listed in Section 3.0 of this report.

B.1 ENERGY CONSERVING FUNCTIONS

B.1.1 Scheduled Start/Stop

Scheduled start/stop is the starting and stopping of a system based on the time and type of day. Type of day refers to weekdays, Saturdays, Sundays, holidays, or any other day with a specific schedule of operation. This is the simplest of all EMCS functions to install, maintain, and operate. It also provides the greatest potential for energy conservation if systems are currently operated unnecessarily during unoccupied hours. When applied to environmental systems, the function generally includes a temperature sensor in the conditioned space which prompts the EMCS to override the shutoff if the temperature goes below or above a certain level. Using this function in an EMCS for all applicable systems can potentially save fan motor or pump motor energy as well as energy used to heat outside air, by eliminating unnecessary operation of a system. Energy to heat outside air can be saved only in a system which brings in outside air.

B.1.2 Duty Cycling

Duty cycling consists of the shutdown of a system for predetermined short periods of time during normal operating hours. The function is based on the fact that HVAC systems seldom operate at peak output; thus, if a system is switched off for a short period of time, it has sufficient capacity to overcome the slight temperature drift which occurs during this shutdown. Although the interruption does not reduce the net space heating or cooling energy, it does reduce energy input to constant auxiliary loads such as fans and pumps. Cycling will reduce the heating and cooling loads by reducing the quantity of outside air admitted to the space when the supply fan is off. Systems are generally cycled off for a fixed period of time; for example, systems may be off 15 minutes out of each hour of operation. The off period should be adjusted automatically to satisfy space temperature conditions, which will result in a longer off period during moderate seasons and a shorter off period during peak seasons.

Duty cycling does produce additional wear on belts and motor starting circuits, especially when applied to large fans which develop high-torque loads during start-up.

B.1.3 Demand Limiting Start/Stop

Demand limiting software stops electrical loads to prevent setting a high electrical demand peak. The EMCS predicts demand on the basis of monitored data. When these predictions exceed preset limits, preselected electrical loads are shut off, thus reducing the rate of consumption and the predicted peak demand. Additional loads are turned off on a priority basis if the initial load shed action does not reduce the predicted demand sufficiently to satisfy the function requirements. As in duty cycling, a slight temperature drift must be allowed for shutting off the HVAC equipment. The duty cycling and demand limiting functions must be coordinated to prevent conflicting commands.

B.1.4 <u>Direct Digital Control</u>

During periods when HVAC equipment is operating, temperature control in spaces can be improved and controlled to chosen setpoints more closely by allowing the EMCS to provide direct digital control of the system. Some areas are currently overheating and overcooling and have little provision for temperature control; implementing direct digital control in those areas would involve controlling valves and dampers based on space temperature sensor input.

For the purposes of this analysis, the proposed occupied setpoints (after EMCS installation) are 68°F winter and 78°F summer.

B.1.5 <u>Unoccupied Setback</u>

The unoccupied setback function saves energy by decreasing heating temperatures and increasing cooling temperatures during hours when buildings are not occupied. This function would be applied in conjunction with the time scheduled start/stop function for cooling systems and forced air heating systems. The EMCS will set upper and lower temperature limits as a basis for determining when the HVAC system must operate.

The unoccupied setback function should not be applied to heating and cooling systems serving areas which require 24 hours of space conditioning, such as barracks, laboratory areas and computer rooms.

The proposed unoccupied temperature setpoints used in this analysis are 55°F for heating and 90°F for cooling.

B.1.6 Ventilation/ Recircuation Damper Control

A damper control interface allows the EMCS to close the outside air damper when the fan system must be operating but no ventilation is required. Damper control has the potential to save the

energy required to heat the outside air to environmental conditions; this function was considered on all systems which bring outside air into the space.

Ventilation levels were assumed to remain unchanged during occupied hours; therefore, savings were considered only during pre-occupancy warm-up.

B.1.7 Economizer

Using an outside air economizer cycle can be cost effective when applied to mechanical cooling systems. Where applicable, the cycle uses outside air to satisfy all or a portion of the cooling requirements of the building or zone when the temperature of the outside air is less than that of the return air from the space. Outside air is introduced through the mechanical system, and return air is exhausted rather than recirculated. When the temperature of the outside air is greater than that of the return air from the space, the EMCS positions the outside air damper to a minimum position.

B.1.8 Optimum Start/Stop

An additional feature of the time scheduled operation is the optimized start/stop feature available with the EMCS. Mechanical systems serving areas which are not occupied 24 hours a day or do not require special environmental conditions should be shut down during the unoccupied hours. Traditionally, the systems are restarted to cool or heat the space prior to occupancy, and then shut down at the end of the work day. Start/stop optimization usually works on a fixed schedule, independent of such factors as weather and space conditions. This software automatically starts and stops the system at times which will minimize the energy required to provide the desired environmental conditions during occupied hours. In addition, this function automatically evaluates the thermal inertia of the structure, the capacity of the system to either increase or reduce temperatures in the facility, start-up and shut-down times, and weather conditions. In this way, the EMCS can accurately determine the minimum hours of operation required of the HVAC system to satisfy the thermal requirements of the building.

B.1.9 Hot Water Outside Air Temperature Reset Schedule

This function was considered for hot water boilers and converters. Hot waters boilers and converters were originally installed to maintain satisfactory temperatures in the space during design weather conditions; consequently, the hot water supply temperature is higher than required when the heating requirements for the facility are reduced. For most facilities, this reduction in heating requirements is directly related to an increase in outdoor temperature. Where applicable, reducing the temperature of the supply water in response to outdoor temperature will affect operating savings. To accomplish this function, the temperature controller for the hot water supply is reset on a predetermined schedule in response to outdoor temperature.

B.1.10 Chilled Water Temperature Reset

The energy required to produce chilled water in a reciprocating or centrifugal machine is a function of the chilled water temperature as it leaves the machine; the higher the temperature, the lower the energy input per ton of refrigeration. This application program resets chilled water temperature upward until the required space temperature and humidity levels can no longer be maintained. This determination is made by monitoring the space temperatures and humidity.

B.2 EMCS MONITORING FUNCTION

B.2.1 Run-time Reports

Several maintenance procedures associated with mechanical equipment are related to the number of operating hours of the specific item of equipment. These maintenance functions include lubrication, bearing checks, and overhaul schedules. With run-time reports, maintenance functions can be performed closer to actual need, rather than on a calendar basis. No additional hardware is required to provide this function, because it is generated in software as a result of monitoring the motor status contact. This monitoring is required for the various start/stop functions.

B.2.2 Energy Metering

This software monitors and accepts readings from various energy meters and then totalizes the energy consumption (including BTu, flow, kW, or kWh) over 15 minute, hourly, daily, monthly, or yearly periods. The resulting values are stored in memory and can be printed in a report format upon the operator's request.

B.2.3 Temperature Monitoring

This function provides the system operator with the space temperature of a given area or the operating temperature of a given piece of equipment and will signal the system operator if these temperatures drift outside their programmed limits. The space temperature in a computer room is an example of this function.

B.2.4 Status Condition Monitoring

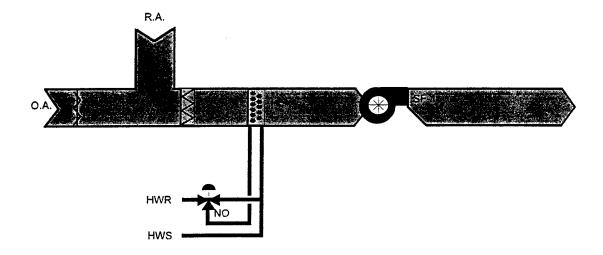
This function is provided for all equipment directly controlled by the EMCS. It allows the EMCS operator to ensure that equipment scheduled to be operating at a given time is actually operating and that equipment scheduled to be off at a given time is indeed off. Without this

function unauthorized personnel could easily circumvent EMCS control of a given piece of equipment, and the EMC operator would not know.

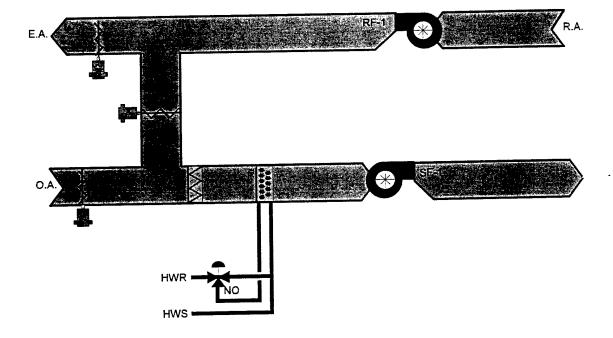
APPENDIX C TYPICAL HVAC SYSTEM

APPENDIX C.1 TYPICAL HVAC SYSTEM SCHEMATICS

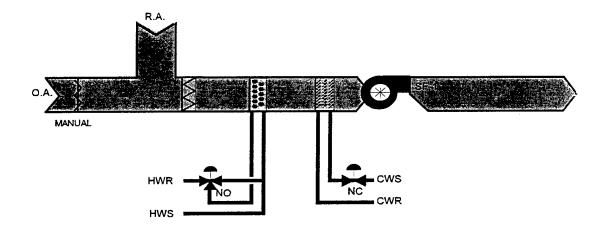
1.HEATING AND VENTILATING UNIT WITHOUT RETURN FAN



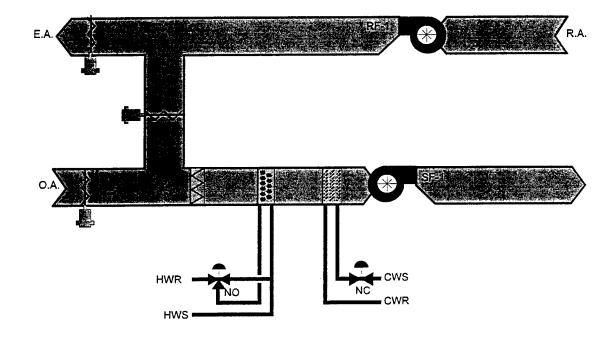
2. HEATING AND VENTILATING UNIT



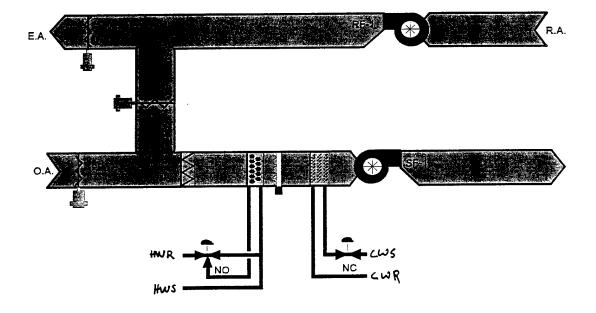
3. SINGLE ZONE AHU WITHOUT RETURN FAN

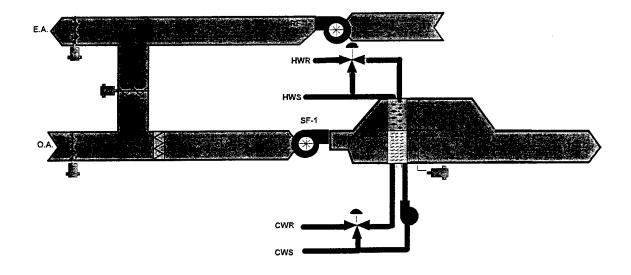


4. SINGLE ZONE AHU

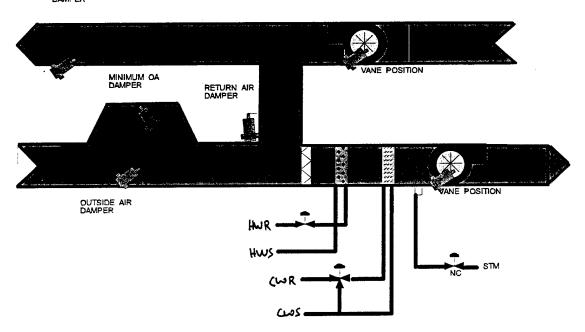


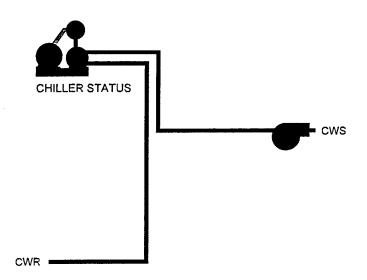
5. SINGLE ZONE AHU WITH HUMIDIFICATION



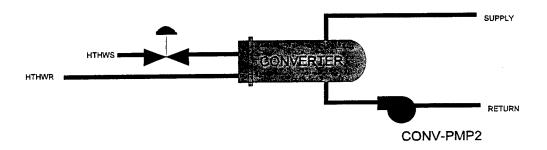


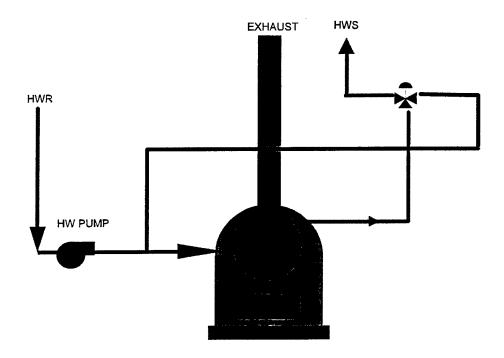
EXHAUST DAMPER



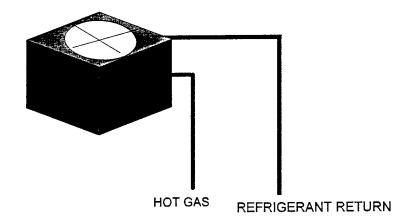


9. CONVERTER AND PUMPS

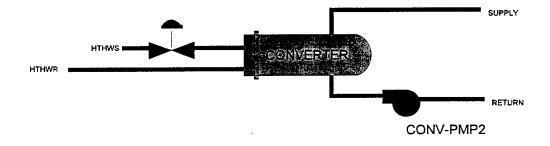




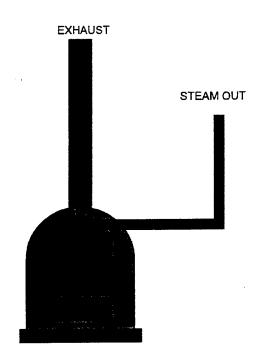
11. CONDENSING UNIT



12. PERIMETER RADIATION



13. STEAM HUMIDIFICATION



14. VENTILATION UNIT



APPENDIX C.2

TYPICAL HVAC SYSTEM I/O SUMMARY TABLES

The I/O summary tables in Appendix C indicate typical HVAC systems and the proposed EMCS hardware configurations.

TYPICAL HVAC SYSTEM NO. 1 HEATING AND VENTILATING UNIT WITHOUT RETURN FAN I/O SUMMARY TABLE

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TYPICAL HVAC SYSTEM NO. 4 SINGLE ZONE AHU I/O SUMMARY TABLE

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TYPICAL HVAC SYSTEM NO. 5 SINGLE ZONE AHU WITH HUMIDIFICATION I/O SUMMARY TABLE

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TYPICAL HVAC SYSTEM NO. 6 MULTI-ZONE AHU I/O SUMMARY TABLE

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TYPICAL HVAC SYSTEM NO. 7 VAV AHU I/O SUMMARY TABLE

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TYPICAL HVAC SYSTEM NO. 8 CHILLER AND PUMPS I/O SUMMARY TABLE

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I/O SUMMARY TABLE

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TYPICAL HVAC SYSTEM NO. 9 CONVERTER AND PUMPS I/O SUMMARY TABLE

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TYPICAL HVAC SYSTEM NO. 10 HOT WATER BOILER AND PUMPS I/O SUMMARY TABLE

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TYPICAL HVAC SYSTEM NO. 11 CONDENSING UNIT I/O SUMMARY TABLE

12-Apr-95 BUILDING NUMBER		CONDENSING UNIT	11 GRADHIC DISPLAY	CONDENSING UNIT		- Address - Addr																									OLITSIDE AIR (COMMON)	TOTAL	C-LAST COMMAND
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TYPICAL HVAC SYSTEM NO. 12 BASEBOARD RADIATION I/O SUMMARY TABLE

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TYPICAL HVAC SYSTEM NO. 13 STEAM BOILER (HUMIDIFIER) I/O SUMMARY TABLE

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BUILDING NUMBER		STEAM BOILER (HUMIDIFIER)	SYSTEM TYPE 13 CRAPHIC DISPLAY	STAEM BOILER (MONITORING ONLY)																		OUTSIDE AIR (COMMON)	TC

TYPICAL HVAC SYSTEM NO. 14 VENTILATION UNIT I/O SUMMARY TABLE

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			DUCT TEMPERATURE	L	╄	_		_	_	_	\sqcup	4	4	_	1	4	+	-		+	-	\vdash		4		+-	\vdash	+-	╁╂	4
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		DIGITAL	CONTROL RELAY	L	1	ļ.,	<u> </u>	\sqcup		4	Н	_	_	+	1		4	+	-			⊢	-	+	+	+	\vdash	-	+1	-15
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BUILDING NUMBER		VENTILATION UNIT	SYSTEM TYPE 14																										OUTSIDE AIR (COMMON)	TOTAL
			SYSTEM TYPE	SI IDDI V FAN	SPACE	1																							UTSIDI	IACT

APPENDIX C.3 TYPICAL HVAC SYSTEM COST ESTIMATES

TYPICAL HVAC SYSTEM NO. 1 HEATING AND VENTILATING UNIT WITHOUT RETURN FAN COST ESTIMATE

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY.
Bidg. No.
System No. 1
System Type H&V. UNIT WITHOUT RETURN FAN

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12-Apr-95	Sheet 1	Š		Vendor Catalog
Date	Sheet	Estimator	Checked By	Basis of Est

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 No Of	, ,) Ties	1000	11111	,553	7:11		1	Edurpinelit, Misc.	2
No. of	Unit Meas	ž ž Š	Hrs	Price	Cost	Price	Cost	Unit Price	Cost	
-	EA	2.83	Ľ	25.42	\$72	65.50	\$66			\$137
	EA	1.83		25.42		68.50				
2	EA	2.83	5.65	25.42	\$144	99.50	\$199			\$343
-	FA	183	1 83	25.47	846	105 50	430			6452
			\perp							701
	EA	.83		75.67		47.50				
			\perp							
-	EA	2.83	2.83	25.42	\$72	71.50	\$72			\$143
1	<u>ا</u> لا	2.83		25.42	\$72	120.00	\$120			\$192
	5 6	3.33		25.42		189.50				
	(4	1.03		26.60		40.00				
	E	2.33		25.42		167.50				
	EA	2.83		25.42		229.50				
	EA	2.33		25.42		132.50				
-	!									

SYS-1CS.WK4

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 1
System Type H&V UNIT WITHOUT RETURN EAN

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Date Sheet Estimator Checked By

12-Apr-95 5

1 H&V UNIT WITHOUT RETURN EAN

	TOTAL			\$604		\$363		296\$
		A		-				2
	TYPE	₫		_				1
1	UMCS POINT TYPE	AO				~-		2
		8		_				
								TOTAL
						All Market and All All All All All All All All All Al		
	UMCS							
	Idv	Ĭ	1 Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Nicht Setback	d Ventiltion	mizer		oring	
1	UMCS	NO	1 Schec Optim Duty C Dema Night	Force	2 Econo	3 DDC	4 Monitoring	TOTAL THIS SHEET
Oystelli i ype		5						TOTAL

TYPICAL HVAC SYSTEM NO. 2 HEATING AND VENTILATING UNIT COST ESTIMATE

ESTIMATE DETAILS
Project EEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 2.
System Type H&V UNIT

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13-Apr-95

Date 13-Apr-95
Sheet 1
Estimator KC
Checked By
Basis of Est Vendor Catalog

No. of Units Mult The	Eas Unit Eas Unit EA 2.83 EA 2.83 EA 1.83 EA 1.83 EA 1.83	Total Unit Hrs Price 2.83 25.42 25.4	\$72 \$72 \$144 \$93 \$72 \$72 \$72	Price 65.50 68.50 68.50 105.50 17.50 120.00 199.50	\$66 Price \$66 \$199 \$211	Unit Cost	\$137
Units Meas Unit 1 EA 2.83	Unit 2.83 1.83 1.83 1.83 2.83 2.83 2.83 2.83 2.83 2.83 2.83 2		\$72 \$144 \$93 \$72 \$72	Price 65.50 68.50 68.50 105.50 105.50 120.00 199.50		e,	\$137
1 EA 2.83 2 EA 1.83 2 EA 1.83 2 EA 1.83 1 EA 2.83 1 EA 2.83 1 EA 2.33 1 EA 2.33 1 EA 2.33 1 EA 2.33	2.83 1.83 1.83 2.83 2.83 2.83		\$72 \$144 \$93 \$72 \$72 \$72	65.50 68.50 105.50 17.50 120.00 199.50	\$199		\$137
EA 1.83 2 EA 1.83 2 EA 1.83 1 EA 2.83 1 EA 2.83 EA 2.83 EA 2.83 EA 2.83 EA 2.83 EA 2.83 EA 2.83 EA 2.83	1.83		\$144	68.50 99.50 105.50 47.50 71.50 199.50	\$199		
2 EA 2.83 2 EA 1.83 1 EA 2.83 1 EA 2.83 EA 2.83 EA 2.33 EA 2.33 EA 2.33	1.83		\$144	99.50 105.50 47.50 71.50 120.00 199.50	\$199		
2 EA 1.83 2 EA 1.83 1 EA 2.83 1 EA 2.83 EA 2.83 EA 2.33 EA 2.33 EA 2.33	1.83		\$144	47.50 71.50 199.50	\$199		
2 EA 1.83 1 EA 2.83 1 EA 2.83 EA 2.33 EA 2.33 EA 2.33	1.83		\$93 \$72 \$72	105.50 47.50 71.50 120.00 199.50	\$211		\$343
2 EA 1.83 EA 2.83 EA 2.83 EA 2.33 EA 2.33 EA 2.33 EA 2.33	1.83		\$93 \$72 \$72	47.50 47.50 71.50 120.00 199.50	\$211		
EA 1.83 1 EA 2.83 EA 2.33 EA 2.33 EA 2.33	1.83		\$72 \$72 \$72	71.50 71.50 120.00 199.50	\$72		\$304
1 EA 2.83 1 EA 2.83 EA 1.83 EA 2.33 EA 2.33 EA 2.33	1.83		\$72 \$72 \$72	71.50 71.50 120.00 199.50	\$72		
1 EA 2.83 1 EA 2.83 EA 1.83 EA 1.83 EA 2.33 EA 2.33	2 83		\$72 \$72 \$72	71.50	\$72		
1 EA 2.83 1 EA 2.83 EA 2.83 EA 2.33 EA 2.33 EA 2.33	283		\$72 \$72	71.50	\$72		
1 EA 2.83 1 EA 2.83 EA 2.83 EA 2.83 EA 2.33 EA 2.33	2 83		\$72	71.50 120.00 199.50	\$72		
1 EA 2.83 1 EA 2.83 1 EA 2.83 1 EA 2.33 1 EA 2.33	7 83		\$72	71.50 120.00 199.50	\$72		
1 EA 2.83 EA 2.83 EA 1.83 EA 1.83 EA 2.33 EA 2.33 EA 2.33	2		\$72	120.00	~~~		\$143
EA E E E E E E E E E E E E E E E E E E	2.83	25.42 25.42 26.69 25.42		199.50	07.L¢		\$192
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EA EA EA		26.69		140.50			
EAA		25.42		40.00			
EP				167.50			
E		25.42		229 50			
	+	25.42		132.50			
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ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bidg. No.
System No. 2
System Type H&V UNIT

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Date Sheet Estimator Checked By

13-Apr-95 δ

UMCS UMCS			UMCS POINT TYPE	TYPE		TOTAL
	Z	00	AO	ĪŌ	IA	
1 Schedule ST/SP						
Optimum S1/SF Duty Oycle						
Demand Limit						
Night Setback Forced Ventiltion		7	-	2	-	\$756
2 Economizer					•	
0.000						
s poo						
4 Monitoring			+		-	\$363
TOTAL THIS SHEET	TOTAL	-	2	~	2	\$1,119

TYPICAL HVAC SYSTEM NO. 3 SINGLE ZONE AHU WITHOUT RETURN FAN COST ESTIMATE

SYS-3CS.WK4

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No.
System Type SINGLE ZONE AHU WITHOUT RETURN FAN

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Date 13-Apr-95
Sheet 1
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION		tity		Labor	10		Materia		Eduipine	Equipment, MISC.	2
	No. Of	Unit	MΗ	Total	Unit	Cost	Unit	Cost	Unit	Cost	
	Units	Meas	Unit	Hrs	Price		Price		Price		
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	\$72	65.50	\$66			\$137
SOLENOID		EA	1.83		25.42		68.50				
	0	V 11	2 02	av a	25.42	A71R	00	4200			6514
E/F IRANSDOCER	2	ζ	2.03	2	47.03	20.29	00.00	AC.30			2
		i	,	5	9	07.4	L	0074			6
CURRENT SWITCH		5	S	28.	75.67	\$40	00.001	9014			7014
STATIS BELAV		EA	1.83		25.42		47.50				
		i									
				-							
SPACE TEMPERATURE	-	EA	2.83	2.83	25.42	\$72	71.50	\$72			\$143
DUCT TEMPERATURE	-	EA	2.83	2.83	25.42	\$72	120.00	\$120			\$192
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		E	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
	in the state of th	ΕΔ	2 83		25.42		229 50				
PSI/PSIG (ELEC)		ς < Δ	2.00		25.42		137 50				
COLSIDE AIR LEMPERATORE		5	2.3		24.07		02:30				
MATERIAL STATE OF THE STATE OF											
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in the state of th											
						;					

TOTAL THIS SHEET

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No.
System Type SINGLE ZONE AHU WITHOUT RETURN FAN

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13-Apr-95 5

Date Sheet Estimator Checked By

_					,
TOTAL			\$604	\$534	
	₹		_	_	
TYPE	iO	ŀ	-		
UMCS POINT TYPE	AO	Ĩ	-	2	
	00		-		
UMCS	ICATION				
	APPI	e ST/SP n ST/SP sle Limit tback	/entiltion zer		Ď.
	NO	1 Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback	Forced \ 2 Economiz	3 DDC	4 Monitoring
UMCS	FUNCTI				

TYPICAL HVAC SYSTEM NO. 4 SINGLE ZONE AHU COST ESTIMATE

SYS-4CS.WK4

ESTIMATE DETAILS Project EEASIBILITY STUDY FOR EXPANSION OF EMCS. Location FORT DRUM, NY Bldg. No. System No. 4 System Type SINGLE ZONE AHU.	<i>ω</i>							Date Sheet Estimator Checked By Basis of Est	13-Apr-95 1 KC Vendor Catalog	jo Di	2
POINT DESCRIPTION	Quan	itv		Labor	١		Material	_	Farrinment	Misc	TOTAL
1	No. Of Units M	Unit	MH/ Unit	Total Hrs	Unit	Cost	Unit	Cost	Unit Cost	Cost	5
CONTROL RELAY W/H-O-A	-	EA	2.83	2.83	25.42	\$72	65.50	\$66	201		\$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER	6	EA	2.83	8.48	25.42	\$215	99.50	\$299			\$514
CURRENT SWITCH	2	EA	1.83	3.65	25.42	\$93	105.50	\$211			\$304
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	1	EA	2.83	2.83	25.42	\$72	71.50	\$72			\$143
DUCT TEMPERATURE	7	EA.	2.83	5.65	25.42	\$144	120.00	\$240			\$384
AVG. IEMPERALORE	-	<u>ا</u> ا	2,50	0.00	25.42	COA	140.50	\$200			\$284
WATER TEMPERATURE (PLUM)		S &	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		ËĀ	2.83		25.42		229.50				
OUTSIDE AIR TÉMPERATURE		EA	2.33		25.42		132.50				
AND AND AND AND AND AND AND AND AND AND										 	
				:							
											1
TOTAL THIS SHEET						\$680		\$1,086			\$1,766

ESTIMATE DETAILS
Project EEASIBILITY STUDY FOR EXPANSION OF EMCS.
Location EORT DRUM, NY
Bldg. No.
System No. 4
System Type SINGLE ZONE AHU

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13-Apr-95 Š

Date Sheet Estimator Checked By

Schedule ST/SI Optimum ST/SI Duty Cycle Demand Limit Night Setback Forced Ventilitic Economizer Monitoring	UMCS		UMCS POINT TYPE	TYPE		TOTAL
The offset of th		8	AO	۵	₹	
Unto STSP Over And Link Control of the Control of t	1 Schedule ST/SP					
oring	Optimum ST/SP					
Sethack Autoritisen Autoritis	Duty Cycle Demand Limit					
1 4 Septiminary	Night Setback					
nnizer	Forced Ventiltion	1		2	τ-	\$584
oring 2 3-6	2 Economizer					
oring 2 1 856					2	\$647
oring 2 1 SS	3 DDC				·	
oring			2		***	\$534
	4 Monitoring					
						-

TYPICAL HVAC SYSTEM NO. 5 SINGLE ZONE AHU WITH HUMIDIFICATION COST ESTIMATE

ESTIMATE DETAILS
Project EEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 5
System Type SINGLE ZONE AHU, WITH HUMIDIFICATION

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Date 12-Apr-95
Sheet 1
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quai	ntity		Labor	ō		Materia	e	Fauinment Misc	nt Misc	TOTAL
	No. Of U	Unit Meas	MH/	Total	Unit	Cost	Unit	Cost	Guit	Cost	
CONTROL RELAY W/H-O-A	-	EA	2.83	2.83	25.42	\$72	FIICE 65.50	\$66	L		9427
SOLENOID		EA	1.83		25.42		68.50	2			/C 0
E/P TRANSDUCER	က	EA	2.83	8.48	25.42	\$215	99.50	\$299			\$514
CURRENT SWITCH	2	EA	1.83	3.65	25.42	\$93	105.50	\$211			\$304
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	<u></u>	ΕA	283	2.83	25.42	\$77	74 50	677			
DUCT TEMPERATURE	2	EA	2.83	5.65	25.42	\$144	120.00	\$740			\$143
AVG. TEMPERATURE	_	EA	3.33	3.33	25.42	\$85	199.50	\$200			\$284
WATER TEMPERATURE (ELEC)		<u>۵</u>	2.83		25.42		140.50				
SPACE RELATIVE HUMIDITY	-	E E	2.33	2.33	25.42	\$29	167.50	\$168			\$227
		ı	0								
PSI/PSIG (ELEC)		ξ	2.83		25.42		229.50				
COISIDE AIR IEMPERATURE		Š	2.33		75.47		132.50				
		and the second									
OTAL THIS SHEET						\$739		\$1.254			\$1 993

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS. Location FORT DRUM, NY Bidg. No.
System No. 5
System Type SINGLE ZONE AHU WITH HUMIDIFICATION

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Date Sheet Estimator Checked By

12-Apr-95 5

UMCS	UMCS			UMCS POINT TYPE	TYPE		TOTAL
FUNCTION	APPLICATION		8	AO	□	₹	
1 Schedule ST/SP	e 37/SP						
Optimum s Duty Cycle	= 0.1/3.7 cle						
Demand Limit	Limit		٠				
Night S Forced	Night Setback Forced Ventittion		-		2	7	\$811
2 Economizer	izer						
				1		2	\$647
3 DDC				,	و د د د د د د د د د د د د د د د د د د د	₹	\$534
4 Monitoring	Đũ						
TOTAL THIS SHEET		TOTAL		3	2	5	\$1,993

TYPICAL HVAC SYSTEM NO. 6 MULTI-ZONE AHU COST ESTIMATE

SYS-6CS.WK4

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 6
System Type MULTI-ZONE AHU

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Date 12-Apr-95
Sheet 1
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity	tity		Labor	ō		Materia	_1	Equipment		TOTAL
	No. Of Units	Unit Meas	E E	Total Hrs	Price -	Cost	Unit Price	Cost	Unit Price	Cost	
	-	EA	2.83	2.83	25.42	\$72	65.50	\$66			\$137
SOLENOID		EA	1.83		25.42		68.50				
	7	EA	2.83	19.78	25.42	\$503	99.50	\$697			\$1,199
	2	EA	1.83	3.65	25.42	\$93	105.50	\$211			\$304
		ΕĀ	1 83		25.42		47 50				
		ì	3								
SPACE TEMPERATURE	4	EA	2.83	11.30	25.42	\$287	71.50	\$286			\$573
DUCT TEMPERATURE	က	EA		8.48	25.42	\$215	120.00	\$360			\$575
AVG. TEMPERATURE	-	EA	\rightarrow	3.33	25.42	\$85	199.50	\$200			\$284
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
RE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		E	2.33		25.42		167.50				
		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
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						100 10					67.072

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12-Apr-95 Š

ESTIMATE DETAILS	FEASIBILITY STUDY FOR EXPANSION OF EMCS	FORT DRUM, NY		9	MULTI-ZONE AHU
ESTIMATE	Project	Location	Bldg. No.	System No.	System Type

UMCS	UMCS		UMCS POINT TYPE	TYPE		TOTAL
FUNCTION	APPLICATION	OO	AO	۵	A	
1 Schedule ST/SP Optimum ST/SP Duty Cycle	7/SP 7/SP					
Demand Limit Night Setback Forced Ventiltion	nit ck ilition			7	2	\$728
2 Economizer					2	\$647
3 DDC			9		4	\$1,698
4 Monitoring						
TOTAL THIS SHEET	TOTAL	_		2	8	\$3,073

TYPICAL HVAC SYSTEM NO. 7 VAV AHU COST ESTIMATE

SYS-7CS.WK4

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. Z
System Type VAV AHU

of 2	
12-Apr-95	
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ANSION OF EMCS	

TOTAL		\$137	\$115	\$685	\$304			\$287	9204	1070			1000	\$301											10, 00
ment,	Unit Cost Price																					-			
_1	Cost	99\$	69\$	\$398	\$211			\$143	\$240	00.70			000	\$230											
Materia	Price	65.50	68.50	99.50	105.50	47.50		71.50	100.00	140.50	40.00	167.50	000	0C.677	132.50										-
•	cost	\$72	\$46	\$287	\$93			\$144	485	2			673	7/4											
	Price	25.42	25.42	25.42	25.42	25.42		25.42	25.42	25.42	26.69	25.42	75 43	75.47	25.42										
	lotal Hrs	2.83	1.83	11.30	3.65			5.65	3 6	3			200	2.83											
	Z Z	2.83	1.83	2.83	1.83	1.83		2.83	2 23	2.83	1.83	2.33	C	2.83	2.33					-					
	Meas	EA	EA	EA	EA	EA		E E	נ ע	5 2	EA	EA	L	EA	EA										
i and	No. Of Units M	-	1	4	2			2 5	7 -	-											-				1
POINT DESCRIPTION		ONTROL RELAY W/H-O-A	SOLENOID	E/P TRANSDUCER	CURRENT SWITCH	STATUS RELAY		SPACE TEMPERATURE	AND TEMPERATIONS	VATER TEMPERATURE (ELEC)	VATER TEMPERATURE (PLUM)	SPACE RELATIVE HUMIDITY		PSI/PSIG (ELEC)	OUTSIDE AIR TEMPERATURE	And the second s									

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS.
Location FORT DRUM, NY.
Bldg. No.
System No. Z
System Type VAV.AHU.

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Date Sheet Estimator Checked By

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NMCS	UMCS		UMCS POINT TYPE	TYPE		I OI AL
FUNCTION	APPLICATION	8	AO	۵	₹	
1 Sci	hedule ST/SP					
ö Ö	itimum ST/SP					
₫,	ity Cycle					
2 2	mnand Limit					
Ž L	Nignt Setback Forced Ventilition	2		2	2	\$843
2 Ec	2 Economizer					
			1		2	\$647
3 DDC)C				,	
4 Mo	4 Monitoring		, n		7	\$1,00/
TOTAL THIS SHEET	ET TOTAL		,	,	•	207 63

TYPICAL HVAC SYSTEM NO. 8 CHILLER AND PUMPS COST ESTIMATE

SYS-8CS.WK4

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS. Location FORT DRUM, NY Bldg. No.
System No. 8
System Type CHILLER AND PUMPS

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Date 12-Apr-95
Sheet 1
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	1								Equipment, misc.	1, 171100.	()
	No. Of	Unit	MH/	Total	Unit	Cost	Unit	Cost	Unit	Cost	2
	Units Me	Meas	Unit	Hrs	Price		Price		Price		
CONTROL RELAY W/H-O-A	2	EA	2.83	5.65	25.42	\$144	65.50	\$131			\$275
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER		EA	7.83		75.42		99.50				
CURRENT SWITCH	2	EA	1.83	3.65	25.42	\$93	105.50	\$211			\$304
STATIS DELAY		ΕĀ	1 83		25.42		47.50				
SIAIUS ALEAI		í	3		7		200				
SPACE TEMPERATURE		EA	2.83		25.42		71.50				
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)	2	ΕA	2.83	5.65	25.42	\$144	140.50	\$281			\$425
WATER TEMPERATURE (PLUM)	2	EA	1.83	3.65	26.69	\$97	40.00	\$80			\$177
SPACE RELATIVE HUMIDITY		ĘĄ	2.33		25.42		167.50				
		< u	2 83		CN 3C		220 50				
CHECK AND TEMPERATIDE	+	ζ <u>Π</u>	233		25.72		132 50				
OUISIDE AIR LEIMPERATORE		5	20.7		74.67		136.30				
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FEASIBILITY STUDY FOR EXPANSION OF EMCS. FORT DRUM, NY

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ESTIMAT Project Location Bidg. No. System No. System Type

8 CHILLER AND PUMPS

FUNCTION 1 S	301					I V L C L
<u>0</u> 00	APPI ICATION		UMCS POINT 1 YPE	1 YPE		IOIAL
В О О		8	AO	۵	AI	
001	chedule ST/SP	•				
	Asyl a minuted					
	uly cycle emand Limit					
ız	Night Setback	r		r		&£78
4 M	4 Monitoring	4		1		2.5
					C	\$602
				C		
TOTAL THIS SHEET		7		7	7	

TYPICAL HVAC SYSTEM NO. 9 CONVERTER AND PUMPS COST ESTIMATE

SYS-9CS.WK4

ESTIMATE DETAILS Project EEASIBILITY STUDY FOR EXPANSION OF EMCS Location FORT DRUM, NY Bldg. No. System No. System Type CONYENTER AND PUMPS	81							Sheet Sheet Estimator Checked By Basis of Est	12-Apr-95 KC Vendor Catalog	2
POINT DESCRIPTION	Quan	litv		Labor	١		Material		Equipment Misc.	TOTAL
1	No. Of Units M	Unit	MH/ Unit	Total Hrs	Unit	Cost	Unit Price	Cost	Unit Cost Price	
CONTROL RELAY W/H-O-A	-	EA	2.83	2.83	25.42	\$72	65.50	\$66		\$137
SOLENOID		EA	1.83		25.42		68.50			
E/P TRANSDUCER	-	EA	2.83	2.83	25.42	\$72	99.50	\$100		\$171
CURRENT SWITCH	-	EA	1.83	1.83	25.42	\$46	105.50	\$106		\$152
STATUS RELAY		EA	1.83		25.42		47.50			
SPACE TEMPERATURE		EA	2.83		25.42		71.50			
DUCT TEMPERATURE		۲.	2.83		25.42		120.00			
AVG. TEMPERATURE	,	E E	3.33	10 11	25.42	6144	199.50	4000		P ()
WATER TEMPERATURE (PLUM)	7 7	EA	1.83	3.65	26.69	\$97	40.00	\$80		\$177
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50			
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50			
OUTSIDE AIR TÉMPERATURE		EA	2.33		25.42		132.50			
									-	
	-									
TOTAL THIS SHEET						\$431		\$632		\$1,063

ESTIMATE DETAILS
Project EEASIBILITY STUDY FOR EXPANSION OF EMCS.
Location FORT DRUM, NY
Bidg, No.
System No.
System Type CONVERIER AND PUMPS.

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					_
TOTAL		8289		\$773	\$1.063
	₹			2	2
TYPE	ō	-			1
UMCS POINT TYPE	AO			-	
	OO	/			ļ.
					TOTAL
			7		
NMCS	ICATION				
	APPI	I Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback	Ď.	er Reset	
S	NO.	1 Schedule Optimum Duty Cyc Demand Night Se	4 Monitoring	7 Hot Water Reset	IIS SHEET
UMCS	FUNCT				TOTAL THIS SHEET

TYPICAL HVAC SYSTEM NO. 10 HOT WATER BOILER AND PUMPS COST ESTIMATE

ESTIMATE DETAILS
Project EEASIBILITY STUDY FOR EXPANSION OF EMCS
Location EORT DRUM, NY
Bldg. No.
System No. 10
System Type HOT WATER BOILER AND PUMPS.

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Sheet 1
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0 AL			\$137			\$152	\$94					\$425	\$177													
Equipment, Misc.	Cost																									
Eduibme	Unit	Price																								
_1	Cost		99\$			\$106	\$48					\$281	\$80													
Materia	C nit	Price	65.50	68.50	99.50	105.50	47.50		71.50	120.00	199.50	140.50	40.00	167.50	220 50	132.50	201									
	Cost		\$72			\$46	\$46					\$144	297													
2	<u>;</u> =	Price	25.42	25.42	25.42	25.42	25.42		25.42	25.42	25.42	25.42	26.69	25.42	25.47	25.42	!									
Land	Total	Hrs	2.83			1.83	1.83				\perp		3.65													
	Ì.	Unit	2.83	1.83	2.83	1.83	1.83		2.83	2.83	3.33	2.83	1.83	2.33	283	2.33										
	<u>;</u>	Meas	EA	EA	Æ	EA	EA		EA	E	EA	EA	EA	Æ	ΑĦ	íΔ	i									
Kallility	No. 0	Units	1			_	-					2	2													
			CONTROL RELAY W/H-O-A	SOLENOID	E/P TRANSDUCER	CURRENT SWITCH	 STATUS RELAY		SPACE TEMPERATURE	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE (ELEC)	WATER TEMPERATURE (PLUM)	SPACE RELATIVE HUMIDITY	PSI/PSIG (FI FC)	OUTSIDE AIR TEMPERATURE										

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS.
Location FORT DRUM, NY.
Bldg. No.
System No. 10
System Type HOT WATER BOILER AND PUMPS

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<u>10</u> hot water boiler and pumps

Prication AD	NMCS	7	UMCS POINT TYPE	TYPE		TOTAL
1 2 8383 2 8602	APPLICATION	8	Ą	ō	₹	
	1 Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback			i		00 00 00
	4 Monitoring	-		7		000
	7 Hot Water Reset				2	\$602
	·					

TYPICAL HVAC SYSTEM NO. 11 CONDENSING UNIT COST ESTIMATE

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY

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Sheet 1
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Project Location Bldg. No. System No. System Type

11. CONDENSING UNIT

POINT DESCRIPTION	Quai	ntity		Labor	٦٢		Material	- I	Equipment,	nt, Misc.	TOTAL
	No. Of	Of Unit	/HW	Total	Unit	Cost	Unit	Cost	Unit		
CONTROL DELACARGO A	Onits	Weas	OUIL 2 83	SIE C	75 42	\$72	Price 65.50	994	Price		6437
SOL FINDING	-	FA	183	30.7	25.42	7 (*)	68.50	000			0 0
		i			!						
E/P TRANSDUCER		EA	2.83		25.42		99.50				
	-										
CURRENT SWITCH	1	EA	1.83	1.83	25.42	\$46	105.50	\$106			\$152
		Ĺ	2		2		11				
STATUS RELAY		¥	3.		79.67		UC: /4				
SPACE TEMPERATURE		EA	2.83		25.42		71.50				
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		E L	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		16/.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
				T							
TOTAL THIS SHEET						\$118		\$171			\$289

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FEASIBILITY STUDY FOR EXPANSION OF EMCS FORT DRUM, NY Project Location Bldg. No. System No. System Type

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11 CONDENSING UNIT

UMCS	UMCS			UMCS POINT TYPE	TYPE		TOTAL
FUNCTION	APPLICATION		2	Φ	č	۷	
1 \$	schedule ST/SP			2	5	Č	
0	optimum ST/SP						
ם מ	Duty Cycle						
υZ	Definant Linit Night Setback						
	1 7		-		-		\$289
4 ≶_	4 Monitoring						
TOTAL THIS SHEET	1.11	TOTAL	ŀ		ľ		

TYPICAL HVAC SYSTEM NO. 12 BASEBOARD RADIATION COST ESTIMATE

ESTIMATE DETAILS
Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY

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Estimator KC
Checked By
Basis of Est Vendor Catalog

12. BASEBOARD RADIATION Project Location Bldg. No. System No. System Type

								1			ָ -
	No. Of	Unit	/HW	Total	Unit	Cost	Onit	Cost	Unit	Cost	
CONTBOI BEI AV W/H-O-A	Onits	Meas	Unit 2 83	Hrs 2 83	Price	\$77	Price 65 50	950	Price		9427
SOLENDID	-	Æ	1.83	3	25.42	1	68.50	9			40.0
		1	1								
E/P TRANSDUCER	-	EA	2.83	2.83	25.42	\$72	99.50	\$100			\$171
CURRENT SWITCH	1	EA	1.83	1.83	25.42	\$46	105.50	\$106			\$152
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	2	EA	2.83	5.65	25.42	\$144	71.50	\$143			\$287
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)	-	EA	2.83	2.83	25.42	\$72	140.50	\$141			\$212
WATER TEMPERATURE (PLUM)	-	Δi	1.83	1.83	26.69	\$49	40.00	\$40			\$89
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TÉMPERATURE		EA	2.33		25.42		132.50				
The same of the sa											

ESTIMATE DETAILS
Project EEASIBILITY STUDY FOR EXPANSION OF EMCS.
Location FORT DRUM, NY
Bidg. No. 12
System No. 12
System Type BASEBOARD BADIATION

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TOTAL				\$576	\$472	м
YPE	<u> </u>			1		
UMCS POINT TYPE	- Q				-	
	8					
OMCS	אוסוו אטו					
100	ALL	1 Schedule ST/SP Optimum ST/SP	od Limit Setback		ring	
UMCS	NOI	1 Sched Optim	Demai Night 6	3 DDC	4 Monitoring	

TYPICAL HVAC SYSTEM NO. 13 STEAM BOILER (HUMIDIFIER) COST ESTIMATE

ESTIMATE DETAILS
Project EEASIBILITY STUDY FOR EXPANSION OF EMCS
Location EORT DRUM, NY.
Bidg. No.
System No. 13
System Type STEAM BOILER. IHUMIDIEIERI.

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Sheet 1
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity	tity		Labor	٥٢		Materia		Equipme	Equipment, Misc.	TOTAL
	No. Of Units	Unit Meas	Z X	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A		EA	2.83		25.42		65.50				
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER		EA	2.83		25.42	WANTED THE TOTAL	99.50				
CURRENT SWITCH		EA	1.83		25.42		105.50				
STATE OF AV		< L	7		25		1				
SIAIUS KELAY		¥	.83		75.47		06.74				
SPACE TEMPERATURE		Ę	2.83		25.42		71.50				
DUCT TEMPERATURE		E E	2.83		25.42		120.00				
AVG. TEMPERATURE		Æ	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)		Ę	2.83		25.42		140.50				
NATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)	-	EA	2.83	2.83	25.42	\$72	229.50	\$230			\$301
SI/PSIG (PLUM)	1	EA	1.83	1.83	25.42	\$46	40.00	\$40			\$86
TOTAL THIS SHEET											

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EEASIBILITY STUDY FOR EXPANSION OF EMCS. FORT DRUM, NY

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Project Location Bldg. No. System No. System Type

13 STEAM BOILER (HUMIDIFIER)

		1		1	<u></u>
TOTAL				\$388	\$388
	₹			-	-
TYPE	۵				
UMCS POINT TYPE	AO				
	0				
					TOTAL
UMCS	PLICATION				
	A	1 Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback		oring	
UMCS	NOILC	1 Schec Optim Duty (Dema Night	3 DDC	4 Monitoring	TOTAL THIS SHEET
5	FUN				TOTAL

TYPICAL HVAC SYSTEM NO. 14 VENTILATION UNIT COST ESTIMATE

SYS-14CS.WK4

ESTIMATE DETAILS
Project EEASIBILITY STUDY FOR EXPANSION OF EMCS. Location FORT DRUM, NY.
Bidg. No.
System No.
System Type VENTILATION UNIT

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Sheet 1
Estimator KC
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POINT DESCRIPTION	Quantity	tity		Labor	or		Materia		Equipme	Equipment, Misc.	TOTAL
	No. Of	Unit	/HW	Total	Unit	Cost	Unit	Cost	Unit	Cost	
A O MANA 19 1 CONTROL	2115	Meds	2 83	SEC	75 A2	\$77	Frice SE EO	950	Price		9407
SOLENDID	-	E	1.83	3	25.42	7	68 50	9			9
E/P TRANSDUCER		EA	2.83		25.42		99.50				
CURRENT SWITCH	1	EA	1.83	1.83	25.42	\$46	105.50	\$106			\$152
		Ĺ			2,		ļ				
STATUS RELAY		¥ I	1.83		75.67		47.50				
SPACE TEMPERATURE	1	EA	2.83	2.83	25.42	\$72	71.50	\$72			\$143
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)		Ā	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		Ę	1.83		56.69		40.00				
SPACE RELATIVE HUMIDITY		Ā	2.33		25.42		167.50				
		L	c		07		020				
PSI/PSIG (ELEC)		EA	2.83		75.47		06.627				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
A STATE OF THE STA											
Charge of the Control											
									-		
The same of the sa											
TOTAL THIS SHEET						₩ 100		£273			CC100

r-95	TOTAL	-				1 \$433
Date 12-Apr-95 Sheet 1 Estimator KC Checked By	DO AO DI					
<u>EMCS</u>						TOTAL
TE DETAILS FEASIBILITY STUDY FOR EXPANSION OF FORT DRUM, NY VENTILATION UNIT	UMCS UMCS FUNCTION APPLICATION	1 Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback Forced Ventiltion	2 Economizer	3 DDC	4 Monitoring	TOTAL THIS SHEET

APPENDIX C.4

TYPICAL HVAC SYSTEM MANUFACTURERS' CUTSHEETS



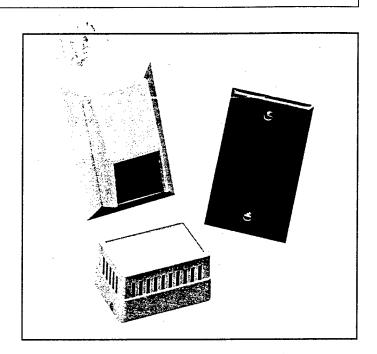
1000 OHM PLATINUM SPACE SENSORS

MODELS ST-S91, ST-S91E, ST-S91P

DESCRIPTION

The **Type 91 Space Temperature Sensors** provide stable, accurate room sensing for temperature control and Building Automation Systems. The room sensors feature: a stainless steel insulated plate; a standard plastic ventilated enclosure; and a deluxe executive enclosure design. The stainless steel plate is ideal for areas of vandalism or where the sensor can be easily knocked off the wall. The sensors are designed for interior use only in the temperature range of 0° to 140°F (-18° to 60°C).

SPECIFICATIONS	
Sensing element	1000 Ω thin film platinum TCR 0.00375 $\Omega/\Omega/^{\circ}$ C
Sensor accuracy lce point resistance Interchangeability	$\pm 0.2\%$ of 1000 Ω at 32°F (0°C) 1000 ohms $\pm 2~\Omega~(\pm 0.2\%)$ ± 0.5 °C or 0.8% of temp at $\pm 0.2\%$ R_0 trim
Temp range	0° to 140°F (-18° to 60°C)



DUCT 74.53×0.5=\$37.5

WATER 115.5×0.5=\$58

OAT 98.5 × 0.5=\$50

TRANSMITTER 80 × 0.5=\$40

ORDERING INFORMATION

MODEL	DESC	RIPTION
ST-S91	Surfac	e Mount 1000 Ohm Thin Film Platinum Room Sensor
	ENCLO	DSURES
	Р	Plastic Ventilated Room Enclosure
	E	Executive Style Room Enclosure
	-	Stainless Steel Plate
ST-S91	Р	Example: ST-S91P Surface Mount 1000 Ohm 375 Platinum Room Sensor with Plastic Ventilated Room Enclosure

Related Product

T91U Rangeable 4-20 mA Temperature Transmitter

TEMPERATURE_

1000 OHM PLATINUM RTD SENSORS

ST-A91, ST-D91, ST-O91, ST-R91S, ST-W91

DESCRIPTION

The **Type 91** temperature sensors utilize a 1000 Ω thin film platinum resistance element. These sensors provide stable, accurate measurement for temperature control and Building Automation Systems, using standard 304 stainless steel probes.

The *Immersion Sensor* comes with a standard brass or optional stainless steel thermowell.

The **Duct Sensor** has mounting tabs for direct mounting on a duct or installation in a handibox.

The *Outdoor Sensor* is equipped with a sun shield and weatherproof box for mounting under the eaves or some other sheltered area. It is rated for outdoor applications.

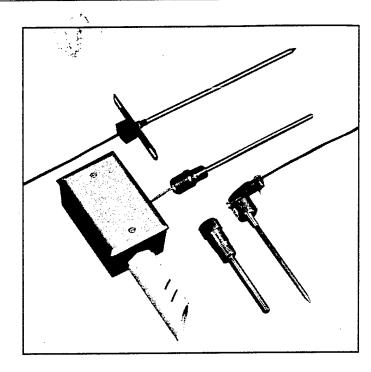
The **Strap-on Sensor** is suitable for direct application to pipe surfaces for chilled and hot water applications.

The **All Purpose Sensor** can be used in any of the above applications.

All of the above sensors are available with an optional 4-20 mA transmitter output. See the T91U Transmitter in this section of the Kele catalog.



- · High accuracy
- · No-drift platinum
- · Interchangeability
- Low cost



SPECIFICATIONS

Ice point resistance

Sensing element 1000 Ω thin film platinum TCR 0.00375 $\Omega/\Omega/^{\circ}$ C

1000 Ω ±2 Ω (±0.2%)

Interchangeability ±0.5°C at 0.8% of temperature

at ±0.2% R_o trim

Sensing element temp range -67° to 302°F (-55° to 150°C)

Long term stability

Recommended current <0.05°C (0.2 Ω) per 5 years

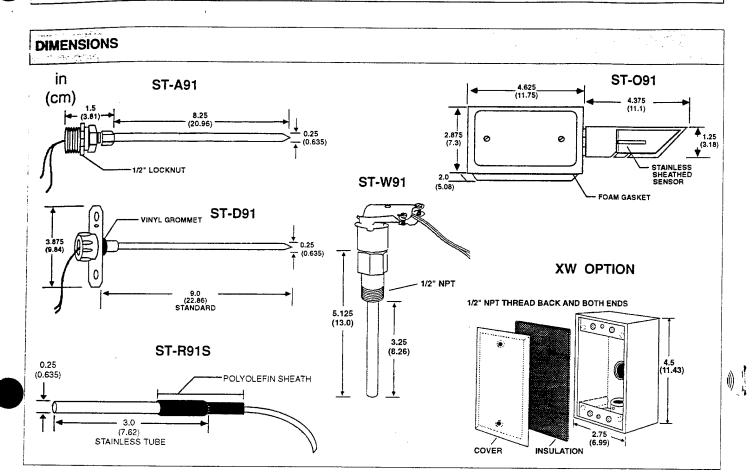
in air environments

1 mA max in still air for <0.3°C (0.5°F) self-heating



1000 OHM PLATINUM RTD SENSORS

ST-A91, ST-D91, ST-O91, ST-R91S, ST-W91



ORDERING INFORMATION MODEL **DESCRIPTION ST-A91** All Purpose Sensor ST-D91 **Duct Sensor** ST-091 Outdoor Air Sensor Strap-on Sensor **ST-R91S** Immersion Sensor with Brass Thermowell ST-W91 Ε Immersion Sensor Without Well S Stainless Steel Thermowell for Immersion Only **OPTIONS** ·XH Handibox Housing (ST-A91, -D91, -W91 only) XW Weatherproof Housing (ST-A91,-D91,-W91 only) Example: ST-W91-XW Immersion Sensor with ST-W91 brass well and weatherproof housing option XW Related Product: T91U 4-20 mA Temperature Transmitters

TEMPERATURE

1000 OHM PLATINUM RTD TRANSMITTER

MODEL T91U

DESCRIPTION

The **T91U** is a rangeable two-wire, 4-20 mA RTD transmitter designed for use with **Type 91** 1000 Ω Platinum RTD Sensors. The transmitter is available in three standard ranges, or can be set for any range between -30° to 250°F (-34° to 121°C) with a minimum span of 40°F (22°C).

To range the **T91U**, set the DIP switches to match your selected range and use the zero and span pots to fine tune your adjustment. (High accuracy digital ohmmeter and decade box required.)

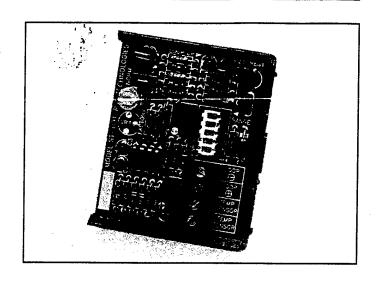
The **T91U** has a special 20 mA loop calibration test signal to provide easy system verification. Simply move the bottle plug jumper from NORM to 20 and the transmitter will output a constant 20 mA. The Loop Up LED provides power indication for the 4-20 mA output.

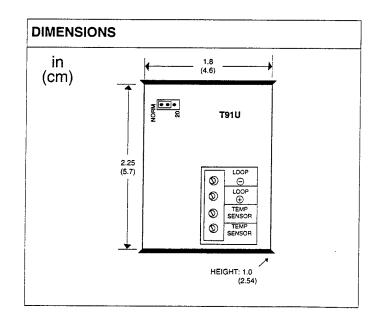
FEATURES

- Switch-set rangeable
- Loop calibration test signal

Low cost

- Snap-track mounting
- Loop power LED indication





SPECIFICATIONS			
Sensor input	1000 Ω thin film platinum TCR 0.00375 Ω/Ω/°C	Max impedance	250 Ω at 15.5 VDC 500 Ω at 20.5 VDC
Configuration	Two-wire, loop-powered		675 Ω at 24 VDC
Rangeability	-30° to 250°F (-34° to 121°C)	Ambient temp	0° to 140°F (-18° to 60°C)
9,	Minimum span of 40°F (22°C)	Humidity	0-95% noncondensing
Output	4-20 mA	Temp effect	0.015% span/°F
Output limit	25 mA (sensor leads open)	Accuracy	0.1°F or 0.2% of span
oop calibration output	` ' '	RTD current	0.65 mA
Supply voltage	10.5 VDC-45 VDC	Dimensions	1.8"W x 2.25"L x 1"H
Supply Vollage	10.5 VDC-45 VDC		(4.6 cm x 5.7 cm x 2.5 cm

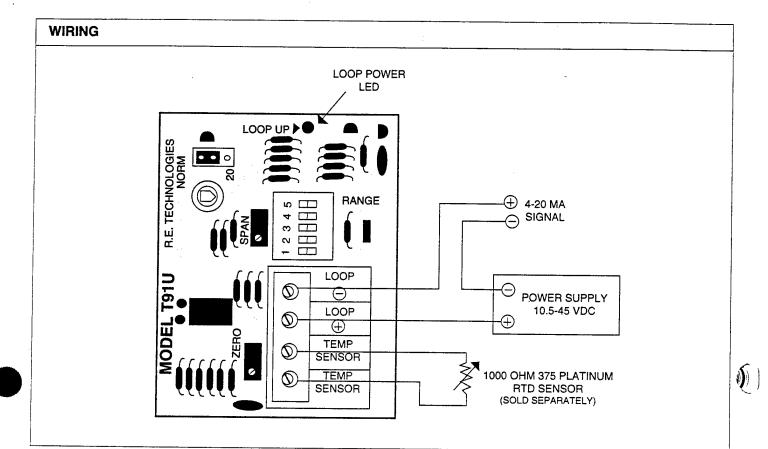


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1000 OHM PLATINUM RTD TRANSMITTER

MODEL T91U



ORDERING INFORMATION

MODEL	DES	CRIPTION
T91U	4-20	mA Rangeable RTD Transmitter
	RANG	SE .
	2	-20° to 140°F (-29° to 60°C)
	3	0° to 100°F (-18° to 38°C)
	4	30° to 240°F (-1° to 116°C)
	XK	Special range
		SENSOR TYPE
	ļ	— Transmitter only
		D ST-D91-XW Duct Sensor (premounted and wired)
		O ST-O91 Outside Air Sensor (premounted and wired)
		W ST-W91-XW Immersion Sensor (premounted and wired)
T91U -	- 2	Example: T91U-2-D Transmitter with range of -20° 140°F (-29° to 60°C) premounted and wired in duct sor enclosure

RELAY SPDT 4.75 X 0.5 = 7.5 BASE 8.22 X 0.36 = 3

RELAYS

RH / RR / RHN SERIES

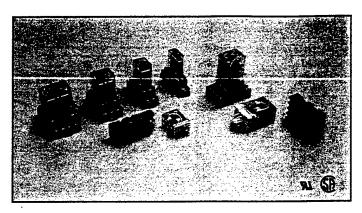
DESCRIPTION

1000

IDEC Relays are available in the RH Series Midget Power Relays, the RR Series Heavy Duty General Purpose Relays, and the RHN Low Amperage Midget Relays. The RH Series Midget Power Relays are compact in size to reduce space requirements and have a full 10 amp switching capacity. RH Series Relays are available in SPDT, DPDT, 3PDT, and 4PDT contact configurations driven by AC or DC coils. RH Series Relays have blade mount terminals and the SPDT, 3PDT and 4PDT are available with top bracket mounting. The DPDT is available as a latching relay.

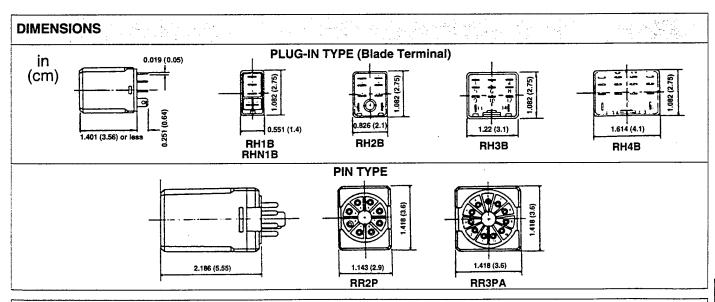
The RR Series Heavy Duty General Purpose Relays have a 10 amp contact rating and are characterized by their high reliability and long life. They are suited for use in industrial grade equipment, control equipment, communications, etc. IDEC RR Series Relays are available in DPDT and 3PDT configurations driven by AC or DC coils. RR Series Relays have pin type terminals.

The RHN Series features a lower amperage coil and silver contacts. These are available in a SPDT blade configuration.



FEATURES

- · General purpose and midget sizes available
- 10 amp contact rating (5 amp available on RHN)
- UL recognized and CSA certified
- Indicator light or check button available on 2, 3, and 4-pole models
- Complete line of accessories for flexible application



CIRCUIT DIAGRAMS THE REPARCE OF THE RESPARCE

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RELAYS & CONTACTORS

RELAYS

RH / RR / RHN SERIES

RATINGS

COI	L RATI	NG RH	SERIE	S										UL & CSA	HORSEPO	OWER
F	Rated		Rat	ted Cur	rent (m	A) ±159	% at 20	°C		Co	oil Resist	ance (Ω)	RATINGS I	RH SERIE	S
Ve	oltage		60	Hz			5	0 Hz			±15% at	20°C				
ll	(V)	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	MOTOR	SPDT,	3PDT
	6	150	200	280	330	170	238	330	387	18.8	9.4	6.0	5.4	LOAD	DPDT	
	12	75	100	140	165	86	118	165	196	76.8	39.3	25.3	21.2	240 VAC	1/3 HP	1/3 HP
AC	24	37	50	70	83	42	59.7	81	98	300	153	103	84.5	120 VAC	1/6 HP	1/6 HP
	120	7.5	11	14.2	16.5	8.6	12.9	16.4	19.5	7680	4170	2770	2220			
	*240		5.5	7.1	8.3		6.5	8.2	9.8	_	15210	12100	9120			
		SPE)T	DP	DT	3F	TDT	4	PDT	SPDT	DPDT	3PDT	4PDT			
DC	6	128		15	0	24	40	2	250	47	40	25	24			
	12	64		75		12	20	1	25	188	160	100	96			
	24	32		36	.9	60)	ϵ	2	750	650	400	388			

COIL RATINGS RR SERIES

Vol	Rated Itage (V)	Rated Current (r 60 Hz	mA) ± 15% @ 20°C 50 Hz	Coil Resistance (Ω) ± 10% @ 20°C
	6	420	490	4.9
	12	210	245	18
AC	24	105	121	79
	120	20.5	24	2,100
	240	10.5	12.1	8,330
	6	2	40	25
DC	12	1	20	100
	24	6	0	400

COIL RATINGS RHN SERIES

OOIL HATHIGE	THE OF THE			
Voltage (VDC)		urrent (mA) @ 20°C	Coil Resis	
	5A	10A	5A	10A
6	50	83.3	120	72
12	25	41.7	480	288
24	12.5	20.8	1920	1150

Note: Maximum continuous applied voltage (AC/DC)@20°C: 110% of rated voltage.

Minimum operate voltage (AC/DC)@20°C: 80% of rated voltage.

Drop-out voltage (AC) @20°C: 30% of rated voltage.

Drop-out voltage (DC) @20°C: 15% of rated voltage.

CONTACT RATING RH SERIES - UL RATINGS

VOLTAGE	RESISTIVE (A)				GE	NERA	L USE(A)
(v)	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT
240 AC	10	10		7.5	7	7	•	5
120 AC	10	10	10	10	7.5			7.5
30 DC	10	10	10		7	7	_	
28 DC	10	10	10	10	7.5	l —		7.5
Note:*6.5A/	Note:*6.5A/Pole, 20A Total							

CONTACT RATINGS RHN SERIES

	RHN1B-5U		RHN1B-10U	
LOAD	RESISTIVE	INDUCTIVE	RESISTIVE	INDUCTIVE
MAXIMUM RATED LOAD	AC: 120V/5A DC: 24V/5A	AC: 120V/3.5A DC: 24V/2.5A	AC: 120V/10A DC: 24V/10A	AC: 120V/7.5A DC: 24V/5A
MAXIMUM OPERATION RATING	AC:550VA DC:120W	AC:385 VA DC:60W	AC: 1100 VA DC:240W	AC:825VA DC:120W
MAX LOAD CURRENT	Ę	5A	1	0A
MAX LOAD VOLTAGE	AC:250V DC:125V		AC:250V DC:125V	

CONTACT RATING RR SERIES

UL RATINGS						
VOLTAGE	RESISTIVE(A)	GEN.USE(A)	MOTOR LOAD			
240 AC	10	7	1/3 hp			
120 AC	10	7.5	1/4 hp			
30 DC	10	7	-			

ORDERING INFORMATION

TYPE	CONTACT CONFIGURATION		W/INDICATOR LIGHT	W/CHECK BUTTON	W/IND. LIGHT & CHECK BUTTON	TOP BRACKET MOUNT TYPE	LATCHING
	SPDT	RHN1B-5U*	÷	_		_	_
	SPDT	RHN1B-10U*		_	_	_	_
	SPDT	RH1B-U		_	<u> </u>	RH1B-UT	_
MIDGET	DPDT	RH2B-U	RH2B-UL	RH2B-UC	RH2B-ULC	RH2B-UT	RH2LB-U
	3PDT	RH3B-U	RH3B-UL	RH3B-UC	RH3B-ULC		_
	4PDT	RH4B-U	RH4B-UL	RH4B-UC		RH4B-UT	
GENERAL	DPDT	RR2P-U	RR2P-UL		_		
PURPOSE	l .		RR3PA-U	RR3P-UL	. _	_	

	AC	DC
AVAILABLE	24V	6V
COILS	120V	12V
	240V	24V

*AVAILABLE IN DC ONLY

Related Products
Sockets
BAM-1000 or DIN-3F Mounting Track

To Order: Select the basic model from the table, indicate AC or DC and the voltage. Example: RH2B-UAC24V - DPDT Midget Relay with 24 VAC coil.

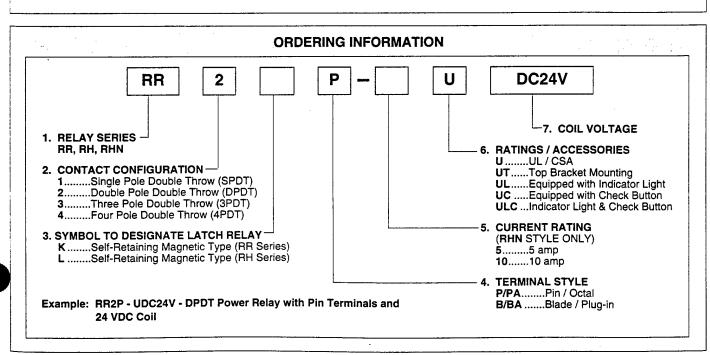
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RELAY SELECTION GUIDE

RR / RH / RHN SERIES

RELAY SELECTION GUIDE

	S		Con	tact		C	oil
	Series	Terminal Style	Configuration	Material	Resistive	Rated Voltage	Power Consumption
	RR Series Power Relays	Pin/Octal	• SPDT • DPDT • 3PDT	Silver	10A, 120 VAC, 240 VAC 10A, 30 VDC 1/3 hp, 240 VAC 1/4 hp, 120 VAC	AC: 6, 12, 24, 120, 240V DC: 6, 12, 24, 48, 110V	AC: 2.5 VA DC: 1.5W
	RH Series Midget Relays	Blade/Plug-in	• SPDT • DPDT • 3PDT • 4PDT	Silver-Cadmium Oxide	10A, 120 VAC 240 VAC 10A, 30 VDC 1/3 hp, 240 VAC 1/6 hp, 120 VAC	AC: 6, 12, 24, 120, 240V DC: 6, 12, 24 48, 110V	• SPDT AC: 1.1 VA DC: 0.8W • DPDT AC: 1.4 VA DC: 0.9W • 3PDT AC: 2 VA DC: 1.7W • 4PDT AC: 2.5 VA DC: 1.5W
The state of the s	RHN Series Low Current Relays	• Blade/Plug-in	• SPDT	Silver	10 amp Model 7.5A, 240 VAC 10A, 120 VAC 10A, 30 VDC 1/3 hp, 240 VAC 1/6 hp, 120 VAC	DC: 6, 12 24, 48V	• 0.3W (5A) • 0.5W (10A)
	RR2KP Series Latch Relays	• Pin/Octal	DPDT	Silver	10A, 120 VAC 10A, 30 VDC	AC: 6, 12, 24, 120, 240V DC: 6, 12, 24, 48, 110V	AC: 2.2 VA DC: 1.5W



一部以下に在在衛生を表記を存在します。

HEAVY DUTY - GENERAL PURPOSE SOCKETS

SR SERIES / SNAP-MOUNT

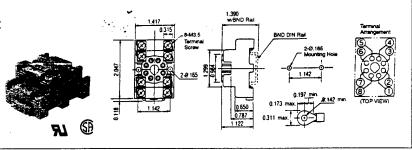
SR2P-05

Type: 8-pin octal, snap-mount/surface-mount **Terminal**: M3.5 screws w/captive wire clamp

Wire Size: Max up to 2-#12 AWG Electrical Rating: 300V, 10A

Relay No.: RR2P Timer No.: RTE-P1

Hold-Down Spring: SR2B-02F1 Hold-Down Clip: SFA-203



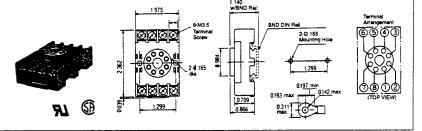
SR2P-06

Type: 8-pin, snap-mount/surface-mount **Terminal**: M3.5 screws w/captive wire clamp

Wire Size: Max up to 2-#12 AWG Electrical Rating: 300V, 10A

Relay No.: RR2P Timer No.: RTE-P1

Hold-Down Spring: SR2B-02F1 Hold-Down Clip: SFA-202



SR3P-05

Type: 11-pin octal, snap-mount/surface-mount Terminal: M3.5 screws w/captive wire clamp

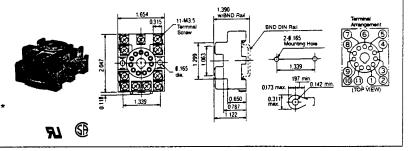
Wire Size: Max up to 2-#12 AWG Electrical Rating: 300V, 10A Relay No.: RR3PA, RR2KP*

Timer No.: RTE-P2

Hold-Down Spring: SR3B-02F1, SR3P-06F3**

Hold-Down Clip: SFA-203

*Latching type relay **For RR2KP relay



SR3P-06

Type: 11-pin octal, snap-mount/surface-mount Terminal: M3.5 screws w/captive wire clamp

Wire Size: Max up to 2-#12 AWG Electrical Rating: 300V, 10A Relay No.: RR3PA, RR2KP *

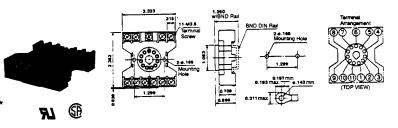
Timer No.: RTE-P2

医衛星属 小浴 在老子

Hold-Down Spring: SR3B-02F1, SR3P-06F3**

Hold-Down Clip: SFA-202

*Latching type relay **For RR2KP relay



Dimensions indicated in inches

NOTE: For Touch-Safe Sockets, add $\underline{\mathbf{C}}$ to the end of the catalog number.

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35 X 0.5 = 17.5

SELECTOR SWITCHES

ASW SERIES

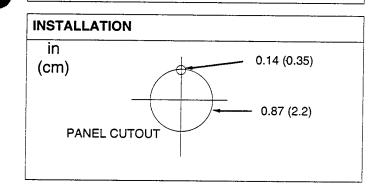
DESCRIPTION

General purpose selector switches for pilot duty control of electrical equipment.

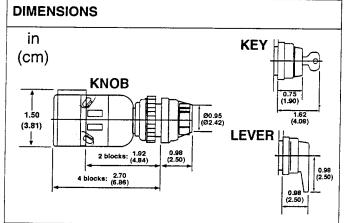
FEATURES

- Snap-fit block comes in N.O. and N.C. contacts
- · Contacts are self-cleaning
- Operator base made of durable nylon
- Switches are UL listed file #E70646 and CSA Certified file #LR48366

SPECIFICATIONS	
Contact resistance	50 MΩ maximum (initial valve)
Insulation resistance	100 M Ω minimum between live and dead parts
Mechanical life	500,000 minimum operations
Electrical life	500,000 minimum operations
Contact rating	10 amps 600 VAC, VDC
Terminals	#6-40 (M3.5) screws
•	(Terminal tab adaptor and
	wire wrap terminal available)







	Assembled Selector Switch	nes
·	1 N.O. Contact 2 Position (Off-On)	2 N.O. Contacts 3 Position (On-Off-On)
Knob Type	ASW210	ASW320
Lever Type	ASW2L10	ASW3L20
Key Type	ASW2K10	ASW3K20
Legend Plate	NWAL (212) - Off-On	NWAL (317) - Hand-Off-Auto

PLATINUM CURVE AVERAGING SENSORS

234X0.5 = \$117

MODEL ST-AV91

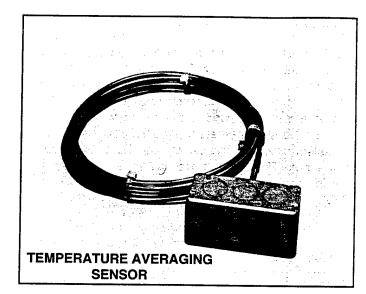
DESCRIPTION

Bendable Area Averaging Sensors

These continuous resistance element **Averaging Sensors** provide accurate sensing of duct temperatures when a large area must be covered. They average temperatures over their entire lengths thus avoiding point measurement errors.

The **Averaging Sensors** use an element that closely matches platinum resistance/temperature characteristics over the specified range of -30° to 240°F (-34° to 116°C).

The sensors have a copper case which is bendable to a radius of 4". They can crisscross a duct or plenum to average out temperature stratification in both directions.



SPECIFICATIONS

Sensor

1000 ohms @ ±0.25% at

32°F (0°C)

TCR 0.00375 Ω/Ω/°C

Probe material

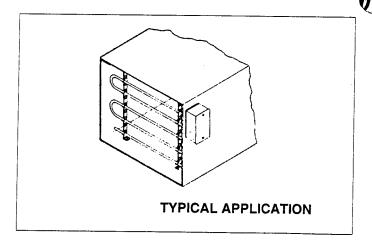
Copper

Length

20 ft (6.1 meters)

Temp range

-30° to 240°F (-34° to 116°C)



ORDERING INFORMATION

ST-AV91

Averaging Duct Sensor 1000 ohm 375 platinum, 20 ft long

Related Product

T91U Rangeable 4-20 mA Temperature Transmitter

80 x 0.5= 40

TOTA L\$ 157

E M C ENGINEERS, INC.

2750 S. Wadsworth Blvd. 9755 Dogwood Rd. Suite C-200 Denver, CO 80227 (303) 988-2951

Suite 220 Roswell, GA 30075 (404) 642-1864

JOB 1406-006	
SHEET NO.	
CALCULATED BY	DATE 4/4/95
CHECKED BY	DATE
SCALE	

LABOR RATE CALCULATIONS

ELECTRICIAN \$28.50/HR (BASE RATES)

PLUMBER \$29,30/HR (BASE RATES)

LOCATION SYRACISE NY.

91,1% MECHANICAL

ELECTRICAL 89.2%

THUREFURE:

ELLC \$28.50 × 89.27 =\$25.42 /HR

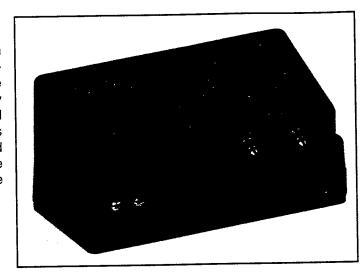
PLUMBER \$29.30 × 91.17 = \$26.69/HR.

MODEL T30

DESCRIPTION

The Modus T30 is a two-wire Pressure Transmitter with a 4-20 mA output. It operates on the capacitance principle and is capable of sensing very low positive, negative or differential pressures. In the capacitance cell, a very lightweight, responsive diaphragm deflects a small amount when pressure is applied. This deflection creates a change in capacitance which is then detected and processed electronically. Reliability and long life are inherent advantages of the solid-state design. A wide selection of standard pressure ranges is available.

373.6/x.50=\$186.80



FEATURES

- · Virtually position insensitive, even at very low pressure (0.01" W.C.) (0.025mbar)
- No moving parts to wear out Compact size
- Fast response time due to low internal volume
- Solid-state circuitry for long life
- Low power consumption

APPLICATION

DIFFERENTIAL PRESSURE TRANSMITTER (DC Powered)

- Medical and analytical instruments
- Leak detection
- HVAC monitoring of:
 - Filter differential pressures
 - Fan static pressures
 - Clean room pressures
 - Variable air volume systems
 - Velocity pressures

SPECIFICATIONS

GENERAL

Accuracy

±1% of range (including non-linearity

and hysteresis)

Zero and span

adjustments

Non-interactive adjustments are by means of 20-turn potentiometers for

fine resolution.

ELECTRICAL

Operating voltage

10 to 35VDC (See diagram on reverse

side for maximum loop resistance).

Protected against reversal of polarity.

Output

Limited to approx. 3.85 mA at low

end of span and approx. 26 mA at

upper end of span.

PRESSURE

Ranges Measures See Ordering Information Differential, gauge pressure or

vacuum. Suitable for air or inert gases.

Maximum safe momentary

Overpressure

8 times pressure range

Port connections

3/16" Dia.suitable for: 1/8" or 5/32"

ID **Tygon**™or polyurethane

tubing; 1/4" OD polyethylene tubing. Integral filters at both ports.

PHYSICAL

Dimensions

3.00"W x 5.15"L x 1.40"H

(7.62 cm x 13.1 cm x 3.5 cm)

Weight 0.42 lb (190 g)

Flame retardant, glass reinforced Case

NORYL ™

ENVIRONMENTAL

Operating

temp range

32° to 125°F (0° to 52°C) -20° to 160°F (-30° to 70°C)

Storage temp ±0.05%/°C Effect of temp

Operating

humidity range

Shock resistance

20% to 90% RH noncondensing 10 a (11 ms)

Vibration resistance 5 g to 50 Hz

5% ROOM HUMIDITY TRANSMITTER

249.61 X 0.5 =\$125

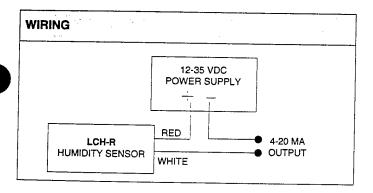
MODEL LCH-R

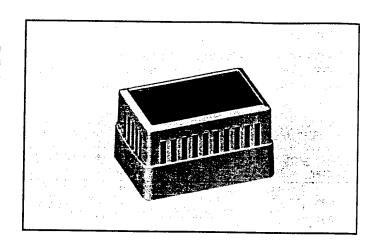
DESCRIPTION

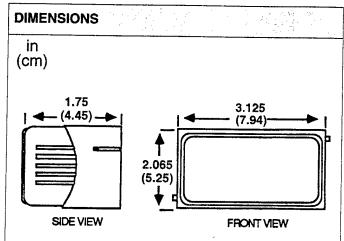
The LCH-R is a low cost General Purpose Wall Mount Room Humidity Transmitter that utilizes capacitance technology. Its wide range and good accuracy make it an ideal humidity transmitter for locations where ±5% relative humidity readings are required. The sensor is designed for indoor applications where relatively stable temperature conditions exist. The sensor should not be exposed to vapors such as acetone that attack plastics.

FEATURES

- Fast response
- Accuracy ±5%
- Humidity span 10 to 90%
- Other output signals available
- Highly stable
- One-year warranty







SPECIFICATIONS

Range 0-100%

Accuracy ±5% (10-90% RH)

Linearity ±3%

Hysteresis < 3% (10 to 90% RH) Temp dependence 0.2% RH per degree C

Response time 10 seconds going from 90% to

(no filter) 10% RH

Operating temp -4° to 140°F (-20° to 60°C),

0 to 100% RH, noncondensing

Storage temp 21° to 158°F (-20° to 70°C),

0 to 100% RH, noncondensing

Transmitter output Power requirement

RFI susceptibility

input voltage effect

Max external load

with standard DC power 4-20 mA unit

250 ohms ±0.1% @ 12 VDC loop voltage, 500 ohms

4-20 mA DC two-wire, (0-100%)

Good RFI rejection to normal

±0.1% 24 VDC loop voltage ±0.005% RH/volt from

Standard 12-35 VDC

operating conditions

8.7V to 45V

ORDERING INFORMATION

LCH-R

RH Space Humidity Transmitter, 4-20 mA output

Other outputs available upon request (nonstock).



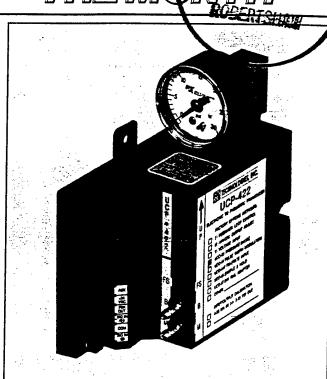


SPECIAL SAVINGS! Loop Powered Pneumatic Transducer

UCP-422 Transducer Requires Less Space and Offers Greater Flexibility and Expandability

UCP-422 Universal Electronic / Pneumatic Transducers provide low cost pneumatic control of valves, dampers or other pneumatic devices. The UCP-422 is a totally enclosed transducer with provisions for optional DIN rail mounting or surface mounting in two planes. When DIN rail mounting is used, this compact controller requires only 2"W x 4"H mounting area, providing efficient use of panel space.

The **UCP-422** accepts a 4-20 mA signal and outputs 3-15 psig (0.207-1.03 bar). Used in its base configuration, it requires no power supply for controlling pneumatic devices.



FEATURES

- · Low cost
- "Slim-line" mounting (saves panel space)
- Quick-disconnect terminals
- Loop-powered control (standard)
- No external filter required
- Excellent linearity
- · High air capacity
- · No calibration required

OPTIONS

- DIN rail mounting
- Pressure gauge
- PWM input
- Tri-state input
- Feedback
- Failsafe
- · Manual-output adjustment

		DEALER					
MODEL	DESCRIPTION	LIST	1-5	6-24	25-49	50+	
UCP-422	4-20 mA to 3-15 PSI Pneumatic Output Transducer	175.00	63.00	61.00	59.00	57.00	
OPTIONS	** **		i				
UCO-42	Failsafe	116.11	41.80	39.50	38.00	37.00	
UCO-43	Pressure Gauge	27.50	9.90	9.40	8.90	8.65	
UCO-44	Pulse Width Input	150.00	54.00	50.00	49.00	48.00	
UCO-44T	Tri-State Input	194.45	70.00	68.00	66.00	64.00	
UCO-47	DIN Rail Mounting Adapter	6.11	2.20	2.20	2.20	1.95	
"F" Option	Feedback	163.89	59.00	58.00	57.00	55.00	
M" Option	Manual Override	30.56	11.00	10.00	9.00	8.50	
"V" Option	Voltage Input	36.11	13.00	12.00	11.50	10.50	

PRICES GOOD THROUGH 8/15/95



1000 OHM PLATINUM ROOM TEMPERATURE TRANSMITTER

58×0.5=\$29

MODEL ST-T91E

DESCRIPTION

The ST-T91E 1000 Ω Room Temperature Transmitter provides stable, accurate room sensing for temperature control and Building Automation Systems.

The vented housing is made of a durable plastic with a tan enameled aluminum faceplate. This attractive enclosure mounts easily.

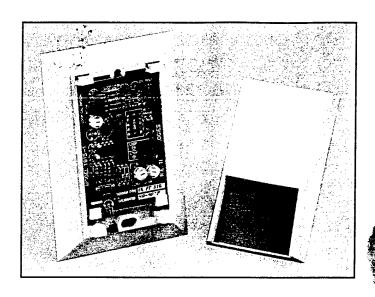
The **ST-T91E** has a loop-powered 4-20 mA output. The standard temperature range is 40° to 90°F (4° to 32°C), although other ranges are available upon request.

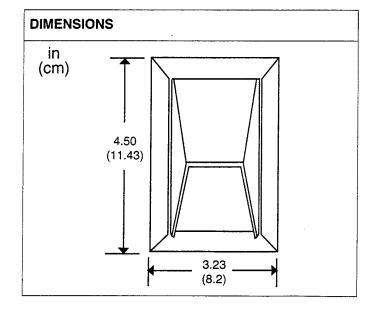
A special 20 mA loop calibration test signal provides easy system verification. Simply move the bottle plug jumper from NORM to 20 and the transmitter will output a constant 20 mA. The Loop Up LED provides power indication for the 4-20 mA output.

Override option: The **XME Option** is a normally open membrane momentary switch typically used to provide an override signal back to the controller input. When this switch is made, the 4-20 mA output signal goes to 3 mA until released.



- · High accuracy
- · No-drift platinum
- · Loop calibration test signal
- Low cost
- Decorative enclosure
- Loop power LED indication
- Membrane override switch (optional)





SPECIFICATIONS

Sensing element 1000 Ω thin film platinum

TCR 0.00375 Ω/Ω/°C

±0.5°C or 0.8% of temp at ±0.2% R_o trim

Configuration Two-wire, loop-powered 4-20 mA

Output limit 25 mA (sensor leads open)

Loop calibration output 20 mA ±0.1%

Supply voltage Max impedance 10.5 VDC - 45 VDC 250 Ω at 15.5 VDC 500 Ω at 20.5 VDC

 675Ω at 24 VDC

Temp operating range

0° to 140°F (-18° to 60°C) 0.015% span/°F

Temp effect Humidity

0.015% span/°F 0-95% noncondensing

Transmitter accuracy

0.2% of span

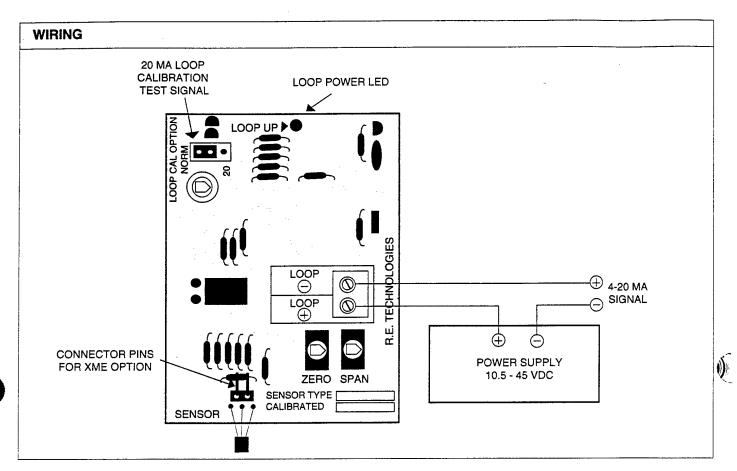
Sensor accuracy

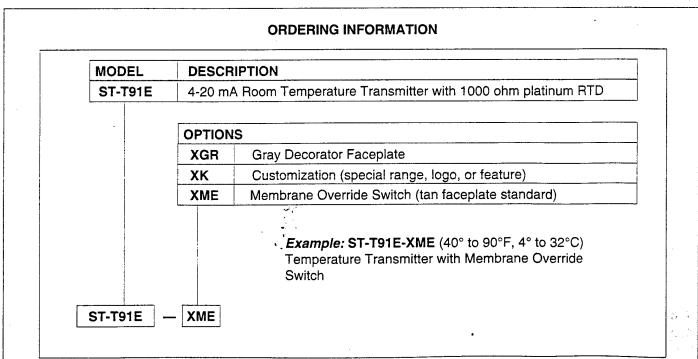
 $\pm 0.2\%$ of 1000 Ω at 0°C



1000 OHM PLATINUM ROOM TEMPERATURE TRANSMITTER

MODEL ST-T91E





CURRENT OPERATED SWITCHES

189×0.36 \$68 D150 / SD150 SERIES

USE THIS DEVICE <u>TO MONITOR AC CURRENTS</u> AND <u>TO</u> SWITCH DC CIRCUITS

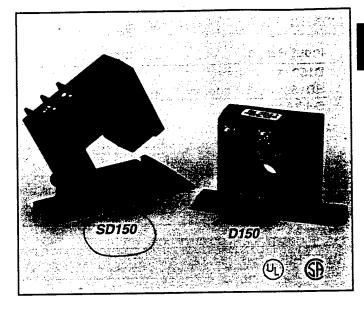
DESCRIPTION

The D150 or SD150 is a Solid-state DC Switch which operates when the current level sensed by the internal current transformer exceeds the threshold values set by the four-turn adjustment. Three selectable ranges offer optimum adjustability and resolution. Internal circuits are totally powered by induction from the line being monitored. The SD150 split-style allows easier installation over existing cables. The new, SMART LED with no off-state leakage current is standard on the SD150.

The D150 / SD150 is recommended for relatively fixed loads where reliable ON/OFF indication or control is needed at lowest cost. See the Model PD75 for monitoring loads which may vary slowly about the setpoint and where high-speed precision switching is required.

FEATURES

- Self-powered
- · Small size
- Simple adjustment
- UL listed, file #E129625
- Solid-state reliability
- · Wide current range
- Low cost
- CSA certified, file #LR-92007



- New SMART LED has no off-state leakage (SD-150)
- Monitor 1-200 amps
- Switch 150 mA continuous 30 VDC
- 5-yr unconditional warranty

APPLICATION

- Direct connection to PLC and DDC inputs, for general status and proof-of-performance monitoring
- Directly control light DC loads, such as lamps and relays, in response to the current of a monitored AC circuit
- Replace differential pressure and air flow switches
- Safety and alarm circuits
- Monitor motors for status or broken belts and couplings
- Heat tracing, heater monitoring

SPECIFICATIONS

Operating temperature

Case

-58° to 149°F (-50° to 65°C)

ABS (meets UL flammability

rating 94V-O)

Insulation class

600V

Off state leakage

D150-1NC-A-NL: 0.25 mA D150-3A: 0.25 mA (N.C. only)

Switching capability (uses NPN type open collector transistors)

Up to 150 mA continuous, 500 mA momentary; 30 VDC

max. Voltage across closed switch is 0.8V max for N.O. and

1.6V max for N.C.

-C Option

Uses bi-polar transistor that reduces on-state voltage

drop to < 0.2V.

Switching capability < 5 mA

Voltage across closed switch

1.5V max

D150 DIMENSIONS

Overall unit

Mounting base

Mounting centers

Through-hole

2.75" (6.99 cm) For alternate mounting, holes are provided on one side for #6 screws. 0.55" diameter, for up to#2/0

2.125"H x 2.125"W x 1.0"D

(5.4 cm x 5.4 cm x 2.54 cm)

3.25" long (8.26 cm) integral

insulated wire THHN, THWN type

insulation).

SD150 DIMENSIONS

Overall unit

Mounting base **Mounting centers** Through-hole

2.5"H x 2.6"W x 1.2"D (6.4 cm x 6.6 cm x 3.05 cm)

3.5" long (8.9 cm) integral

3.0" (7.62 cm)

0.85" square opening, for up to #4/0 cable or larger, depending

on insulation.

Input Range	Jumper	Max Continuous	6 sec	1 000
150: 1-6 Amperes	none	D150 : 175A		1 sec
0150: 1.5-6 Amperes		SD150: 175A SD150: 200A	400A	600A
0 Amperes	mid	150A (Monitor motors in this ran	500A	* 800A
-200 Amperes	high	D150: 175A SD150: 210A	800A	1200/
		(Monitor motors in this ran	ge up to 200 FLA.)	*
			ge up to 2001 LA.)	,

^{*}For motors with higher FLAs and/or longer start times, and for larger diameter conductors, use an external current transformer whose secondary current flows through the sensor.

SWITC	HING	CHARA	CTERIS	TICS

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Innert ()	Low	Range	Mid I	Range	High	Range
Input (amps)	1.0*	6.0	6.0	40.0	40.0	
Hysteresis (amps)					40.0	200.0
Models SD150, D150-1A-NL	-1	0.15		. 05		
Models D150-2A, 3A (N.O.)	ĺ	0.2	į	0.25	<	:0.5
Models D150-3A (N.C. side)	_	U.Z	<(0.2	<	0.2
& D150-1NC-A-NL	<0.05	<0.2	0.15	0.0		
Response times**		- 10.2	0.13	0.8	0.7	5.0
ON delays (ms)	150.0	200.0	70.0			
OFF delays (ms)	i -	200.0	70.0	60.0	40.0	70.0
	60.0	30.0	40.0	20.0	30.0	20.0
*1.5A for SD150						

INSTALLATION

- 1. Make sure that switched current (connected to screw terminals) is limited to 150 mA continuous, 500 momentary, and that applied voltage is no higher than 30 VDC.
- 2. Position the jumper for the desired range and observe maximum currents to prevent sensor failure. *Monitoring* excessive current can damage the sensor.
- 3. Loop the wire through the hole. Looping the wire through the hole more than once multiplies the sensitivity but divides maximum currents.
- 4. The screw terminals represent a solid-state switch for controlling DC loads. Test the unit by using a circuit such as shown in wiring diagram. An ohmmeter is not appropriate for this type of switch.

LED INDICATOR (For SD150 only)

The LED indicates three states:

- 1. RAPID FLASHING: Current has tripped the switch.
- 2. SLOW FLASHING: Current is present but is below the trip point.
- 3. NO FLASHING: Current is either OFF or below the bottom of the range.

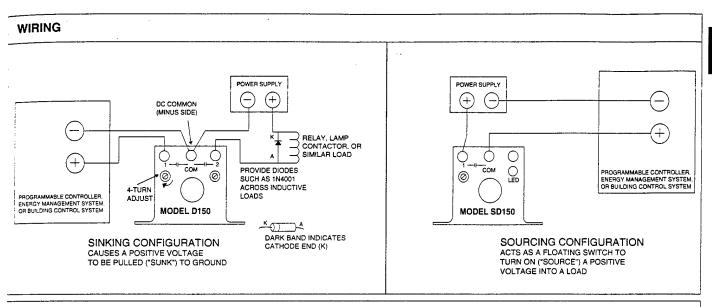
SMART LED indicator on the SD150 has no off-state leakage.

^{**}With sensor set to ranges above and current through sensor 5% above trip point.

POWER MONITORING

CURRENT OPERATED SWITCHES

D150 / SD150 SERIES



ADJUSTMENT

- 1. With the sensor wired as shown, note the LED state. The LED should be off. If no LED, use a voltmeter across the sensor contacts. Turn on the motor or other load being monitored. With "LF" suffix sensors, set the motor to its lowest speed.
- 2. The sensor is shipped with the 4-turn adjustment set to the most sensitive position (CW). If the sensor now operates, turn the adjustment counter-clockwise (CCW) until the operation reverses. The LED or meter will indicate this action.
- 3. Now turn the adjustment CW until the sensor just operates its controlled circuit. It is desirable to turn the adjustment slightly CW beyond this threshold point to provide a margin for normal current variations.

PROBLEM	PROBABLE CAUSE & CORRECTION
Sensor appears to be ON all the time.	Check your circuit for sensitivity to Off-State Leakage. Check for reverse wiring polarity. If sensor is wired backward, the reverse polarity protection diode will make the sensor appear to be on.
Adjustment has no stops. Keeps turning.	The 4-turn adjustment pot has a slip-clutch which prevents damage at either end of its rotation. To know where the adjustment is, turn the pot 4 turns CW; this sets it to the most sensitive position, e.g., 1 amp on the 1 to 6 amp range.
Sensor does not switch at all, regardless of current level.	Adjustment pot is probably backed off completely (4 turns CCW), which disables the sensor. See item immediately above for more on this.

ORDERING INFORMATION

Model D150-1A-NL Model D150-1NC-A-NL Model D150-2A Model D150-3A -C Suffix -LF Suffix **SD150**

Normally Open (no LED) Normally Closed (no LED) 2 N.O. Form A (no LED) N.O. / N.C. Form C (no LED) Reduces switch on-state voltage to <0.2V For variable-frequency systems down to 6 Hz

Split-core N.O. (with SMART LED)

ELECTRIC / PNEUMATIC 3-WAY AIR VALVES

62X0.5=\$31

MODEL EP3

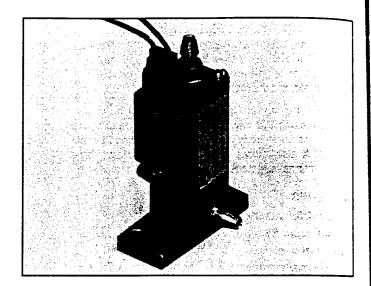
DESCRIPTION

The Model EP3 is an industrial-quality Two-Position, Three-Way Solenoid Air Valve for use in applications where the operation of a pneumatically-operated device is dependent upon an electrical circuit.

A momentary manual override pushbutton provides operation without closing the electrical circuit. An LED provides visual indication of the air valve's status. The valve can be mounted in any position with body mounting holes or with the mounting plate furnished with the valve. Each EP3 also comes with 16" lead wires and three barbed fittings for 1/4" plastic tubing.

FEATURES

- LED indication
- · Industrial quality
- · High capacity
- Manual override
- Universal porting
- · Piping determines N.C., N.O., diverter, or selector



SPECIFICATIONS

Pressure range 0-50 psig C_v 0.04 Flow constant

Air capacity 500 scim at 15 psig supply

with 1 psig pressure drop

Media Air or inert gases

Air connections #10-32 (includes 3 barbed

fittinas)

Ambient temp range

0° to 122°F (-18° to 50°C)

Filtration

Recommended, 40 micron

Lubrication

Not required

115V*/2.5W

Coil voltage/power

24V*/2.5W

Voltage tolerance

+15%, -10% of rated coil voltage

Coil

Rated for continuous duty

Materials

Electroless nickel. Buna N, stainless steel,

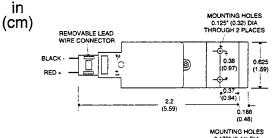
anodized aluminum

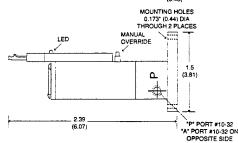
Wiring 16" lead wires with removable

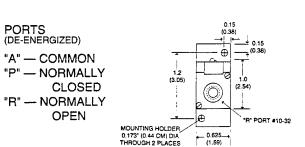
connector

*Voltage can be AC (50/60 Hz) or DC. For AC operation, use AC lead wire model #2587-7, included with 24 VAC and 120 VAC models.

DIMENSIONS







ORDERING INFORMATION

EP3-24VAC EP3-24VDC **EP3-120VAC** 24 VAC 3-Way Air Valve 24 VDC 3-Way Air Valve 120 VAC 3-Way Air Valve

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Model	Description	Manuf.	Range	Output	Accuracy	List	Code	
CH-R	SPACE/ OFFICE	RE TECH	10-90%	4-20 mA	±5%	249.61	A	
HW10K*	SPACE / EXECUTIVE DECORATOR	RE TECH	0-100%	4-20 mA	±3%	355.56	A	
HD10K	DUCT & OUTSIDE AIR	RE TECH	0-100%	4-20 mA	±3%	383.34	A	
EL3K	REPLACEABLE ELEMENT FOR HD10K, HW10K	RE TECH				208.34	. А	
HW20K	SPACE / EXECUTIVE DECORATOR	RE TECH	0-100%	4-20 mA	±2%	430.56	A	
HD20K	DUCT	RE TECH	0-100%	4-20 mA	±2%	497.23	· A	
HO20K	OUTSIDE AIR	RE TECH	0-100%	4-20 mA	±2%	505.56	A	
HMD20U	DUCT & OUTSIDE AIR	VAISALA	0-100%	4-20 mA	±2%	775.01	A	
HMD30U	DUCT & OUTSIDE AIR	VAISALA	0-100%	0-5 VDC	±2%	972.23	Α	
WMK-20	OSA SUN SHIELD AND MOUNTING							
	KIT FOR HD10K & HMD20U & HMD30U	VAISALA				41.67	A	
HMW20U	ROOM	VAISALA	0-100%	4-20 mA	±2%	658.34	Α	
HMW30U	ROOM	VAISALA	0-100%	0-5 VDC	±2%	811.12	Α	
HMK20	HUMIDITY CALIBRATOR	VAISALA	0-100%	Visual	±2%	2291.69	A	
HM34	PORTABLE HUMIDITY METER	VAISALA	0-100%	Visual	±2%	1097.23	В	
CT-829-A-MH	ROOM	HY-CAL	0-90%	4-20 mA	±2%	450.00	A(0.5)	= e< =
CT-829-H19-X20	DUCT	HY-CAL	0-90%	4-20 mA	±2%	486.12	A(0.5)	<u>-</u> «γ
CT-829-H19-X21	DUCT & OUTSIDE AIR	HY-CAL	0-90%	4-20 mA	±2%	486.12	Α	
CT-880-C	EXPL. PROOF TRANSMITTER	HY-CAL	0-100%	4-20 mA	±2.5%	2555.58	A	
SA-728-A	LOOP-POWERED METER	HY-CAL	0-100%	Visual		763.90	В	
A21	ASPIRATED SENSOR HOUSING					277.78	В	
TO*	THERMISTOR TEMPERATURE						1	
	SENSOR OPTION					26.39	A	
XMH**	MEMBRANE (PUSH BUTTON)					22.22	Α	4

Thermistor Temperature Sensor Option (see catalog for available curves)

Membrane override push button option for HW20K only

HUMIDISTATS ()					
Model	Description	Manuf.	Range	List	Code
W43A-14	ROOM	JOHNSON	0-70%	110.92	С
HC-101	ROOM	BARBER-COLMAN	10-90%	149.00	С
HC-201	DUCT	BARBER-COLMAN	15-95%	149.00	С

DEWPOINT SE	NSOR Y				建建等
Model	Description	Manuf.	Output	List	Code
DP-3	DEWPOINT	GENERAL EASTERN	4-20 mA	2152.80	A

Model	Description	List	Code
EWB	ENTHALPY-WET BULB ASPIRATED ENCLOSURE (NO SENSOR)	1097.23	Α
ST-EWB-91-XP(1)	1,000 ohm .00375 PLATINUM RTD MATCHED SENSORS WET OR DRY BULB SENSOR	106.81	A
T91U-5	4-20 mA TRANSMITTER 30 to 110°F ±.4°F	122.22	A
ST-EWB-3-XP ⁽¹⁾	4" THERMISTOR 30 to 200°F ±.4°F MATCHED SENSORS WET OR DRY BULB SENSOR	81.81	А
J-6317-50	5 GALLON TRANSLUCENT DISTILLED WATER RESERVOIR	20.83	A
CLS	INTAKE FILTER WITH DISPOSABLE ELEMENT	188.89	A

RELAYS & CONTACTORS

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Model	Туре	· Contact Rating	List	Code
RH1B-UAC 24 V	SPDT	10 AMP	14.75	В
RH1B-UAC 120 V	SPDT	10 AMP	14.75	В
RH1B-UDC 24 V	SPDT	10 AMP	13.42	В
RH2B-UAC 24 V	DPDT	10 AMP	15.72	6.30B=5
RH2B-UAC 120 V	DPDT	10 AMP	15.72	b. 36 B= 5
RH2B-UDC 24 V	DPDT	10 AMP	14.92	В
RH2LB-UDC 12 V	DPDT-LATCHING	10 AMP	41.11	В
RH2LB-UDC 24 V	DPDT-LATCHING	10 AMP	41.11	В
RH3B-UAC 24 V	3PDT	10 AMP	19.44	В
RH3B-UAC 120 V	3PDT	10 AMP	19.44	В
RH3B-UDC 24 V	3PDT	10 AMP	18.56	В
RH4B-UAC 24 V	4PDT	10 AMP	23.81	В
RH4B-UAC 120 V	4PDT	10 AMP	23.81	В
RH4B-UDC 24 V	4PDT	10 AMP	23.08	В
(L) SUFFIX	LIGHT		4.11	В
(C) SUFFIX	CHECK BUTTON		2.06	В

RRR2P-UAC 24 V	DPDT	10 AMP	24.78	В
RR2P-UAC 120 V	DPDT	10 AMP	24.78	В
R2P-UDC 24 V	DPDT	10 AMP	23.22	В
RR3PA-UAC 24 V	3PDT	10 AMP	29.69	- B
R3PA-UAC 120 V	3PDT	10 AMP	29.69	В
RR3PA-UDC 24 V	3PDT	10 AMP	29.06	В
L) SUFFIX	LIGHT		4.11	В
C) SUFFIX	CHECK BUTTON		2.06	В

Model	Туре	List	Code
SH1B-05	SPDT-RH RELAY SOCKET	8.22 = -2	.90 B
SH2B-05	DPDT-RH RELAY SOCKET	10.06 = 3.	62 B
SH3B-05	3PDT-RH RELAY SOCKET	11.03	В
SH4B-05	4PDT-RH RELAY SOCKET	14.39	В
SR2P-06	DPDT-RR RELAY SOCKET	8.22	В
SR3P-06	3PDT-RR RELAY SOCKET	11.03	В

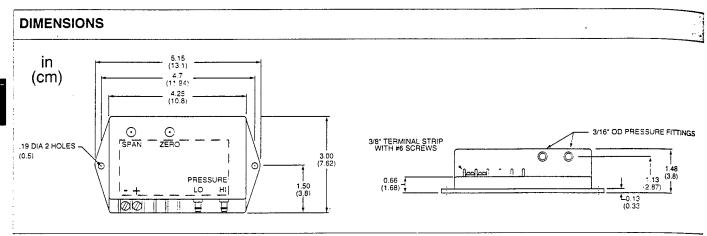
MOUNTING TRACK			Act The State of Control of the State of the
BAM-1000	39" RAIL, ALUMINUM	11.28	B
DIN-3F	1 METER, STEEL	11.81	B

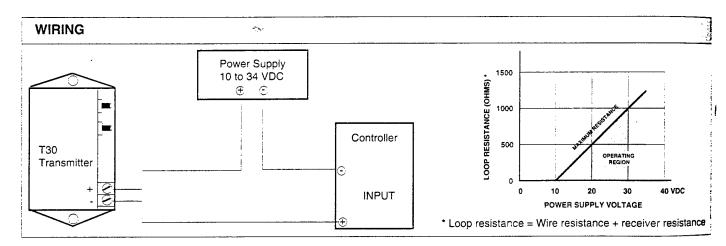
Model	Description	Rating	List	Code
IBU1C	SPDT (MINI-RIB)	10 AMP	37.44	В
IBU2C	2-SPDT	10 AMP	63.94	В
IBU1S	SPDT W/HOA	10 AMP	45.56	В
IBU2S	2-SPDT W/ 1-HOA	10 AMP	71.95	В
IBU2S2	2-SPDT W/ 2-HOA	10 AMP	80.00	В
RIB24P	DPDT	20 AMP	71.67	В

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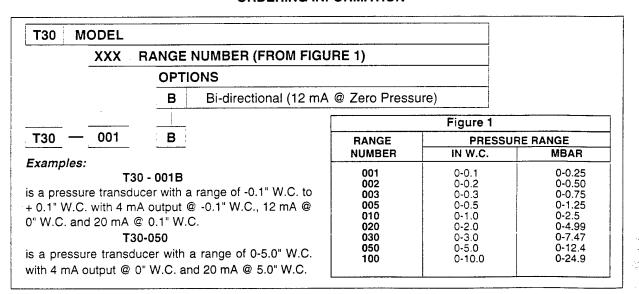
DIFFERENTIAL PRESSURE TRANSMITTER (DC Powered)

MODEL T30



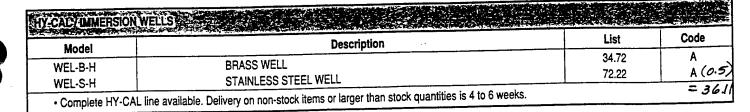


ORDERING INFORMATION



TEMPERATURE





Model	TATE SENSORS (CSI, OPTO-22) Description	List	Code
	SPACE/ OFFICE	31.25	A
T102-1-F	•= •=	37.50	Α
Γ102-1-F-EX	SPACE / EXECUTIVE DECORATOR	40.28	l A
T102-1-S-F	SPACE/ STAINLESS STEEL	47.64	A
T102-D-F	DUCT	80.33	A
T102-W-F*	IMMERSION / BRASS WELL		1
T102-WH-F	IMMERSION-HIGH TEMP	101.11	A
T102-OD-F	OUTSIDE AIR	71.03	A
	STRAP-ON (Also see APB-28)	36.81	A
T102-ORS-F	RAW SENSOR	20.28	A

Model	SENSORS Description	List	Cod
	SPACE/ OFFICE	31.25	A
T102-1-I	SPACE / EXECUTIVE DECORATOR	37.50	A
T102-1-I-EX		40.28	A
T102-1-S-I	SPACE/ STAINLESS STEEL	47.64	A
T102-D-I	DUCT	80.33	A
T102-W-I	IMMERSION / BRASS WELL	71.03	Ä
T102-OD-I	OUTSIDE AIR	'	
T102-ORS-I	STRAP-ON (Also see APB-28)	36.81	A
T102-O-I	RAW SENSOR	20.28	.) A

Model	Description	List	Code
	1/2" x 1/2" BRASS WELL - 2.5" ELEMENT	27.53	A
WB-2.5	1/2" x 1/2" BRASS WELL - 4" ELEMENT	32.50	A
WB-4	1/2" x 1/2" BRASS WELL - 6" ELEMENT	48.61	A
WB-6	1/2" x 1/2" BRASS WELL - 9" ELEMENT	73.61	A
WB-9	1/2" x 1/2" BRASS WELL - 9 ELEMENT	50.00	A
WS-2.5		58.33	A
WS-4	1/2" x 1/2" 304SS WELL - 4" ELEMENT	75.00	A
WS-6	1/2" x 1/2" 304SS WELL - 6" ELEMENT	97.22	A
WS-9	1/2" x 1/2" 304SS WELL - 9" ELEMENT	25.00	A
WEL-B	PRECON BRASS WELL	66.11	A
WEL-S	PRECON STAINLESS STEEL WELL	34.72	Â
WEL-B-H	HY-CAL BRASS WELL		
WEL-S-H	HY-CAL STAINLESS STEEL WELL	72.22	A
FB-3	1/8" TO 1/2" ADAPTER	7.92	. A
F2N-D	1/2" TO 1/8" ADAPTER-NYLON	5.56	A
F2B-D	1/2" TO 1/8" ADAPTER-BRASS	7.92	A



APPENDIX D ALGORITHMS AND ENERGY CONSTANTS USED IN ANALYSIS

APPENDIX D

ALGORITHMS AND ENERGY CONSTANTS USED IN ANALYSIS

D.1 GENERAL

The EMCS energy savings were calculated using the guidelines presented in NCEL Manual CR 82.030, Standardized EMCS Energy Savings Calculations. This manual was used as a guide in preparing calculation formula and for computer simulation of energy savings. Energy savings formula simulations are managed by a computer analysis program developed by E M C Engineers, Inc.

The computer analysis program consists of the following:

- System variables which are derived from field survey data. (These are explained in Subsection D.2.)
- Energy constants which are developed for use with hand calculation for various EMCS control functions. (These are explained in Subsection D.3.)
- Energy savings formula. (These are described in Subsection D.4.)

The field data is entered into the computer analysis program, and the calculations are made using the indicated formula.

D.2 SYSTEM VARIABLE

Associated with the energy constants are variables which pertain to the system operation and capacities. These variables are used in formula along with energy-described constants to estimate the savings from the implementation of certain EMCS functions.

cfm HTG = Cfm of heating capacity for a given air handling system.

cfm CLG = Cfm of cooling capacity for a given air handling system.

EFF = An average annual conversion efficiency for heating systems at Fort Drum. The value used is representative of a typical boiler plant.

EFFHP = The typical motor efficiency for the name plate horsepower rating.

HRSON = The total number of hours a mechanical system would operate per year after EMCS installation (i.e., proposed hours of operation).

HRSAV	=	The number of hours saved per year which would result from the installation of an EMCS with a fixed time schedule (i.e., the number of hours/year a system is presently operating minus the proposed number of hours on/year).
kW/ton	=	The input power to mechanical refrigeration per output tonnage of air conditioning (kW/ton).
Motor HP	=	The rated horsepower of a mechanical system.
% Area	=	The percentage of a building which a heating system serves.
% OA	=	Percentage of outside air brought in by a mechanical system.
Tons	=	The rated cooling capacity output of an air conditioning unit (1 ton = 12,000 Btu).
Load Factor	=	The percent of loading of a motor.
MOSON	=	The total number of months a mechanical system would operate per year.
MBtu	=	The rated heating capacity output of a heating unit.

D.3 ENERGY CONSTANTS

COAUHC =

Twelve categories of constants were developed for use in energy equations applicable to certain EMCS functions at Fort Drum. These constants are defined below.

The first three categories considered are used in equations which calculate the energy required to condition outside air. These equations apply to all buildings with systems using outside air.

COAU = Average energy (kWh) required to cool one cfm of OA to 85°F for one hour during the typical hours the building is unoccupied. This is the proposed unoccupied temperature setpoint for the cooling season.
 COAUC = Cooling-only systems related to COAU.

2. HOAO = Average energy (Btu) required to heat one cfm of outside air to 68°F during the typical hours the building is occupied. This is the proposed occupied temperature for the heating systems.

Cooling and heating systems related to COAU.

HOAOH = Heating-only system related to HOAO.

HOAOHC = Heating and cooling system related to HOAO.

3. COAO = Average energy (kWh) required to cool one cfm of OA to 78°F for one hour during the typical hours the building is occupied. This is the proposed occupied temperature for the cooling systems.

COAOC = Cooling-only system related to COAO.

COAOHC = Heating and cooling system related to COAO.

4. DC = Estimated average percent of motor operating time which can be saved through duty cycling.

5. ECM = Average cooling energy (kWh) saved per hour per cfm, for an economizer system operating during occupied hours.

ECC = The value of ECM for cooling-only systems.

ECHC = The value of ECM for combined heating and cooling systems.

6. NSUC = Average electric energy (kWh) saved per cfm per hour for cooling air by shutting the system down during the hours the building is unoccupied.

NSUCC = Cooling-only system related to NSUC.

NSUCHC = Heating-cooling system related to NSUC.

7. DDC = Average electrical energy (kWh) saved per cfm per hour for cooling, by providing direct digital control during the hours the building is occupied.

DDCC = Cooling-only system related to DDC.

DDCHC = Heating-cooling system related to DDC.

8. NSC = Heating energy savings (MBtu) per UA resulting from unoccupied setback.

DSC = Heating energy savings (MBtu) per UA resulting from direct digital control.

9. FV = Heating energy savings (Mbtu) per cfm per hour by providing forced ventilation/recirculation for the first hour of daily system operation.

10. OPT = The number of hours saved per year through optimal start/stop program calculated from NCEL CR 82.030.

- 11. CHWR = Chilled water reset factor calculated from NCEL CR 82.030.
- 12. OAR = Outside air reset factor for hot water boilers calculated from NCEL 82.030.

D.4 ENERGY SAVINGS FORMULA FOR EMCS FUNCTIONS

The following equations are used in the computer analysis program to calculate savings resulting from using EMCS. The variables and constants used in the equations are explained in Subsection D.2 of this Appendix.

Time Schedule Start/Stop

a. Motor electrical energy savings:

$$kWh/yr = (motor hp) \times (0.7456 kW/hp) \times (80\% Load Factor) \times (HRSAV) / (EFFHP)$$

b. Outside air cooling savings:

$$kWh/yr = (cfm CLG) x (\% OA) x (HRSAV) x (COAU)$$

Optimized Start/Stop

Motor electrical energy savings:

$$kWh/vr = (Motor hp) \times (0.7456 kW/hp) \times (80\% Load Factor) \times (OPT)/(EFFHP)$$

Demand Start/Stop

$$kW/yr = (Motor hp) \times (0.7456 kW/hp) \times (80\% Load Factor) \times (MOSON) \times (DC) / (EFFHP)$$

Demand Chiller

$$kW/yr = (Tons capacity) x (kW/ton) x (MOSON) x (DC)$$

Savings by Ventilation and Recirculation

a. Heating savings:

MBtu/yr = (cfm HTG) x (% OA) x (FV) x
$$1/10^6$$

b. Cooling savings:

$$kWh/yr = (cfm CLG) x (\% OA) x (COAU) x (OPT)$$

Economizer

Cooling savings:

$$kWh/yr = (cfm CLG) x (ECHC) x (HRSON)$$

Outside Air Reset

$$MBtu/yr = (MBtu) x (OAR)$$

Chilled Water Reset

$$kWh/yr = (Tons capacity) x (CHWR)$$

Direct Digital Control

a. Building heating savings:

$$MBtu DSB = DSC x Area$$

b. System heating savings:

$$MBtu/yr = (\% Area) x (MBtuDSB)$$

c. System cooling savings:

$$KWh/yr = (DSUC) x (cfm CLG) x (HRSON)$$

Unoccupied Setback

a. Building heating savings:

$$MBtu NSB = NSC x Area$$

b. System heating savings:

$$MBtu/yr = (\% Area) x (MBtu NSB)$$

c. System cooling savings:

$$kWh/yr = (NSUC) x (cfm CLG) x (HRSAV)$$

D.5 DERIVATIONS OF ENERGY CONSTANTS

Computer simulations were performed to calculate many of the energy constants which are used in the computer analysis program. Simulations were performed on 28 different building category types, to derive constants which specifically relate to the type of building construction and its use.

Table D-1 below lists the 28 building categories simulated.

TABLE D-1 BUILDING CALCULATIONS

CATE- GORY	TYP. BLDG	USE	OCCUPANCY HOURS	OCCUPANCY DAYS
1	36	Medical Center	0700-1600	M-F
2	1750	Motor Repair Shop	0600-1730	M-F
3	2060	Mnt Hangar Avum, Hangar Zone	0600-2200	M-F
4	2060	Mnt Hangar Avum, Ops Zone	0000-2400	S-S
5	2065	AF Ops Building, 24HR Ops Zone	0000-2400	S-S
6	2065	AF Ops Building, Admin Zone	0600-1700	M-F
7	4230	Mini Mall w/ Gas	0000-2400	S-S
8	4305	Phys Fit Center	0645-2000	M-F
9	4530	SMA Building	0730-1630	S-S
10	10000	Div Cmd/Ctrl Building	0600-1800	M-F
11	10205	Dental Clinic	0700-1600	M-Sat
12	10207	Exchange/Club	0800-0300	S-S
13	10506	Clinic w/o Beds	0700-1600	M-Sat
14	10522	Adm & Supply, Enl Brk w/o Din, Admin Zone	0600-1700	M-F
15	10522	Adm & Supply, Enl Brk w/o Din, Barracks Zone	0000-2400	M-F
16	10550	Enl Pers Dining	0400-2400	S-S
17	10630	Bn HQ Building	0600-1700	S-S
18	10670	Veh Mnt Shop	0700-1900	S-S

TABLE D-1
BUILDING CALCULATIONS

CATE- GORY	TYP. BLDG	USE	OCCUPANCY HOURS	OCCUPANCY DAYS
19	10715	Post Safety/LEA, 1st Floor	0000-2400	S-S
20	10715	Post Safety/LEA, 2nd Floor	0600-1700	M-F
21	10730	Clo Sales/Main Retail	1000-2000	S-S
22	10745	Child Support Center	0700-1900	S-S
23	10785	Chapel/Rel Ed/Child Care, Rel Ed/Child Care Zone	0600-1800	M-F
24	10785	Chapel/Rel Ed/Child Care, Chapel Zone	0800-1400	Sun
25	10785	Chapel/Rel Ed/Child Care, Chapel Offices Zone	0600-1700	Sun-F
26	11050	Clinic w/o Beds/Supply/Incin, Main Zone	0700-1900	M-F
27	11050	Clinic w/o Beds/Supply/Incin, Emergency Zone	0000-2400	S-S
28	2060	Mnt Hangar Avum, Admin Zone	0600-1800	M-F

A summary of the energy constants determined by computer simulation are shown in Table D-2, starting on the following page.

TABLE D-2 ENERGY CONSTANTS

Constant	Category 1	Category 2	Category 3	Category 4	Category 5	Category 6	Category 7	Category 8	Category 9	Category 10
HOAUHC	0	0	0	0	0	0	0	0	0	0
НОАОН	0	0	0	0	0	0	0	0	0	0
COAUHC	0.000163	0	0	0	0	0	0	0	0	0.000008
COAUC	0.000425	0	0	0	0	0	0	0	0	0.000022
HOAOHC	92.200	121.660	0	0	0	12.415	0	77.485	150.00	990.6
НОАОН	150.000	198.240	0	0	0	24.899	0	126.260	245.000	14.774
COAOHC	0.00187	0	0	0	0	0	0	0	0	0.000008
COAOC	0.004870	0	0	0	0	0	0	0	0	0.000021
DC DUTY	0	0	0	0	0	0	0	0	0	0
DC DEMAND	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
ECC	0	0	0	0	0	0	0.000102	0	0	0
ECHC	0	0	0	0	0	0	0.000039	0	0	0
NSUCHC	0.000049	0	0	0	0	0	0	0	0	0.000008
NSUCC	0.000080	0	0	0	0	0	0	0	0	0.000013
DDCCHC	0.000204	0	0	0	0.000143	0	0.00007	0	0	0
DDCCC	0.000531	0	0	0	0.000429	0	0.000184	0	0	0
NSC	61000.00	58482.63	23030.56	0	0	28875.52	0	54079.42	80700.00	59665.73
DSC	4850.00	2040.12	0	4589.49	57944.89	7704.77	22630.80	9759.71	2760.00	8706.75
FV	0	0	0	0	0	0	0	0	0	6.150
CHWR	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57
OAR	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.40	7.4
DPT	188	188	188	188	188	188	188	188	188	188

TABLE D-2 ENERGY CONSTANTS (Continued)

Category 20	0	0	0	0	97.912	196.364	0	0	00	0.17		0	0	0	0	0	21605.66	1181.36	320.63	9.57	7.4	188
Cate 2																						
Category 19	0	0	0	0	0	0	0	0	0	0.17	0.00000037	0.00000012	0	0	09000000	0.000018	0	4063.56	0	9.57	7.4	188
Category 18	0	0	0	0	8.678	15.769	0	0	0	0.17	0	0	0	0	0	0	9258.21	2364.59	0	9.57	7.4	188
Category 17	0	0	0	0	158.00	257.00	0	0	0	0.17	0	0	0	0	0	0	62463.86	4842.60	0	9.57	7.4	188
Category 16	0	0	0	0	24.345	39.669	0	0	0	0.17	0	0	0	0	0	0	93908.84	33928.52	0	9.57	7.4	188
Category 15	0	0	0	0	0	0	0	0	0	0.17	0	0	0	0	0	0	0	14014.94	0	9.57	7.4	188
Category 14	0	0	0	0	110.072	220.749	0	0	0	0.17	0	0	0	0	0	0	48647.18	5839.57	0	9.57	7.4	188
Category 13	0	0	0.000808	0.00211	139.724	227.676	0.001285	0.003351	0	0.17	0	0	0.00017	0.000277	0.000132	0.000344	25939.13	3810.62	0	9.57	7.4	188
Category 12	0	0	0.00373	0.00967	28.365	46.219	0.00220	0.00573	0	0.17	0.000298	0.000114	0.00131	0.00213	0	0	32052.63	11846.36	63.71	9.57	7.4	188
Category 11	0	0	0.00167	0.00434	142.477	232.161	0.00326	0.00851	0	0.17	0	0	0.0005	0.000814	0.000097	0.000252	54069.77	4353.31	0	9.57	7.4	188
Constant	HOAUHC	HOAUH	COAUHC	COAUC	НОАОНС	НОАОН	COAOHC	COAOC	DC DUTY	DC DEMAND	ECC	ECHC	NSUCHC	NSUCC	ррсснс	DDCCC	NSC	DSC	FV	CHWR	OAR	OPT

TABLE D-2 ENERGY CONSTANTS (Concluded)

		7			_	7	7	T		_	_	_	_		7	_	_	T -	┰	ī	T	₹
Category 28	0	0	0	0	61.626	123.591	0	0	0	0.17	0	0	0	0	0	0	26974.13	5140.01	0.637	9.57	7.4	
Category 27	0	0	0	0	0	0	0	0	0	0.17	0	0	0	0	0.000224	0.000671	0	62879.93	0	9.57	7.4	
Category 26	0	0	0.000564	0.00137	64.821	129.999	0.00206	0.00615	0	0.17	0	0	0.000144	0.000213	0.0000087	0.000026	48992.31	5036.48	194.425	9.57	7.4	
Category 25	0	0	0	0	173.416	347.786	0	0	0	0.17	0	0	0	0	0	0	32959.70	12599.32	52.292	9.57	7.4	
Category 24	0	0	0	0	185.867	372.756	0	0	0	0.17	0	0	0	0	0	0	251455.00	7010.58	146.880	9.57	7.4	
Category 23	0	0	0	0	115.208	231.049	0	0	0	0.17	0	0	0	0	0	0	5696.09	9936.08	0	9.57	7.4	
Category 22	0	0	0	0	56.316	91.766	0	0	0	0.17	0	0	0	0	0	0	97896.64	25478.95	0	9.57	7.4	
Category 21	0	0	0.000704	0.00184	131.445	214.185	0.00229	0.00598	0	0.17	0.000059	0.000023	0.000094	0.000154	0.000084	0.00022	13725.21	4664.87	92.831	9.57	7.4	
Constants	HOAUHC	НОАОН	СОАИНС	COAUC	HOAOHC	НОАОН	СОАОНС	COAOC	DC DUTY	DC DEMAND	ECC	ECHC	NSUCHC	NSUCC	ррсснс	DDCCC	NSC	DSC	FV	CHWR	OAR	

The energy constants presented in Table D-2 were calculated by using computer simulation methods similar to those outlined in NCEL Manual CR 82.030 "Standardized EMCS Energy Savings Calculations." In general, this consists of simulating system and building operations as they exist using the DOE-2 program, and then performing additional simulations which reflect the implementation of various EMCS control functions. Comparison of the simulation runs indicates the quantity of energy reductions, if any. Care was taken to avoid duplicating energy savings by considering the interrelationships between the various EMCS functions which were being simulated.

The NCEL manual allows the energy savings determined from a building computer simulation to be proportioned to similar systems and buildings. The method used in this study to proportion energy savings to non-simulated buildings placed additional emphasis on the specific parameters of each mechanical system. Energy constants derived from the building computer simulations are expressed in terms which relate to mechanical system size and operation. This approach was made possible through the use of the computer analysis program, to provides an accurate calculation of the energy savings for each system and building.

Computer simulations were also used to determine the direct digital control and unoccupied setback savings available for each of the building types. Temperature setback savings for non-simulated buildings were then determined by applying the ratio of the total floor area of the non-simulated building to the total floor area of the simulated buildings with similar construction and operating schedules; the savings were then adjusted by this ratio.

Constants which were not determined by computer simulation were calculated by the manual methods outlined in NCEL Manual CR 82.030 as follows:

• Duty Cycling/Demand Limiting (DC)

The duty cycling constant equals 10/60, or 0.17, based on the assumption in the NCEL Manual that a system may be shut down an average of 10 minutes per hour.

• Optimal Start/Stop (OPT)

The number of hours saved per year through optimal start/stop (OPT):

$$OPT = (WH \times AND) - ERT$$

where

WH = Present warm-up time prior to occupancy = 2 hrs

AND = Annual number of days total that warm-up is required in days per year

ERT = Equipment run time total required for warm-up in hours per year

• Annual number of days warm up (AND).

Table D-3, below, illustrates the determination of AND (weather data for Ft. Drum) using the Manual criteria.

TABLE D-3 ANNUAL NUMBER OF DAYS WARM-UP

TEMPERATURE RANGE (°F)	OCCURRENCE BETWEEN 01:00 AND 08:00	NUMBER OF DAYS ANNUALLY (HOURS OF OCCURRENCE /8)
60/64	59	7.38
55/59	96	12.00
50/54	141	17.63
45/49	187	23.38
40/44	216	27.00
35/39	254	31.75
30/34	305	38.13
25/29	201	25.13
20/24	146	18.25
15/19	110	13.75
10/14	84	10.50
5/9	50	6.25
0/4	34	4.25
-5/-1	14	1.75
-10/-6	5	0.63
-15/-11	1	0.13
	TOTAL WARM-UP DAYS	238

• Warm-up is required 238 days annually.

- Equipment run time (ERT) is taken from NCEL Document CR 82.030, page 34
 - Annual degree days 7,601
 - From Figure 10, NCEL Manual with heavy construction U=0.12, (refer to Figure 10 at end of Appendix D)
 - ERT = 288 hours/yrs for heavy building construction
- Optimum Start/Stop:

Therefore, OPT for heavy construction is:

$$OPT = (2 \times 272) - 294 = 250 \text{ hrs/yr}$$

• Chilled water reset factor (CHWR)

Table D-4, below, illustrates the determination of CFLH (weather data for Fort Drum) using the Manual criteria.

TABLE D-4
FULL-LOAD HOURS COOLING

MEAN (°F) IN RANGE	09 TO 16 HOURS OF OCCURRENCE	DEGREE HOURS $M = C \times (H - 65^{\circ}F)$
97	3	96
92	24	648
87	94	2068
82	159	2703
77	201	2412
72	196	1372
67	144	288
	TOTAL DEGREE HOURS	9587

 $CHWR = CPT \times REI \times CFLH \times degrees of reset$

where

CPT = 0.72 kW per ton for typical centrifugal chiller

CPT = 0.915 kW per ton for typical reciprocating chiller

CFLH = equivalent full-load hours for cooling

 $= 9,587 / (87 - 65^{\circ}F) = 436 \text{ hrs/yr}$

REI = rate of efficiency increase per °F increase of chilled water

temperature

= 0.012 for reciprocating chiller from NCEL manual

Degrees of reset = $2^{\circ}F$ (from NCEL manual)

Therefore,

for reciprocal, CHWR = $0.915 \times 436 \times 2 \times .012 = 9.57 \text{ kW-hr/tons}$

• Hot water outside air reset factor (OAR)

 $OAR = HFLH \times EI$

where

HFLH = annual equivalent full load hours for heating in hr/yr

EI = efficiency; increase = 0.01 from NCEL manual CR 82.030,

page 57.

Table D-5, below, illustrates the determination of HFLH (Weather data from Fort Drum) per NCEL manual.

TABLE D-5
FULL-LOAD HOURS HEATING

MEAN (°F) IN RANGE	09 TO 16 HOURS OF OCCURRENCE	DEGREE HOURS N = C x (65°F - H)
60/64	113	339
55/59	146	1,168
50/54	166	2,158
45/49	171-	3,078
40/44	190	4,370
35/39	223	6,244
. 30/34	235	7,755
25/29	166	6,308
20/24	122	5,246
15/19	78	3,744
10/14	53	2,809
5/9	27	1,566
0/4	12	756
-5/-1	5	340
	TOTAL DEGREE HOURS	45,881

 $HFLH = \underline{45,881 \text{ °F-hr/yr}} / 65 - 3 \text{°F (design heating temp)} = 740 \text{ hr/yr}$ Therefore,

D.6 DERIVATION OF SYSTEM VARIABLES

The hours of system operation (HRSON) depend on the building occupancy and on the length of the heating and cooling seasons. Systems are switched over from heating to cooling in early May and back to heating in early October by facility maintenance personnel. Therefore, the heating season used for the purpose of analysis was from October 1 through May 15 (32 weeks), and the cooling season was from May 15 through September 30 (20 weeks).

A sample calculation for determining HRS ON/YR from the different occupancy schedules is shown below. An additional two hours for morning warming or cooling of the building prior to occupancy was added to the occupancy schedule to account for morning warm-up.

• Building occupied 0900-1700 (8 hrs/day, 7 days per week)

$$\frac{HRS ON}{yr} = \frac{20 \text{ wks x}}{yr} \frac{7 \text{ days}}{wk} \times \frac{10 \text{ hrs}}{day} = \frac{1400 \text{ hrs}}{yr} \text{ (cooling only system)}$$

$$\frac{HRS ON}{yr} = \frac{32 \text{ wks x}}{yr} \times \frac{7 \text{ days}}{wk} \times \frac{10 \text{ hrs}}{day} = \frac{2240 \text{ hrs}}{yr} \text{ (heating only system)}$$

$$\frac{HRS ON}{yr} = \frac{52 \text{ wks x}}{yr} \times \frac{7 \text{ days}}{wk} \times \frac{10 \text{ hrs}}{day} = \frac{3640 \text{ hrs}}{yr} \text{ (heating & cooling system)}$$

Buildings occupied 24 hours per day, 7 days per week

$$\frac{\text{HRS ON}}{\text{yr}} = \frac{20 \text{ wks x}}{\text{yr}} \times \frac{7 \text{ days}}{\text{wk}} \times \frac{24 \text{ hrs}}{\text{day}} = \frac{3360 \text{ hrs}}{\text{yr}} \text{ (cooling only system)}$$

$$\frac{\text{HRS ON}}{\text{yr}} = \frac{32 \text{ wks x}}{\text{yr}} \times \frac{7 \text{ days}}{\text{wk}} \times \frac{24 \text{ hrs}}{\text{day}} = \frac{5376 \text{ hrs}}{\text{yr}} \text{ (heating only system)}$$

$$\frac{\text{HRS ON}}{\text{yr}} = \frac{52 \text{ wks x}}{\text{yr}} \times \frac{7 \text{ days}}{\text{wk}} \times \frac{24 \text{ hrs}}{\text{day}} = \frac{8626 \text{ hrs}}{\text{yr}} \text{ (heating & cooling system)}$$

The hours of system operation which can be saved (HRSAV) as a result of installing the EMCS are dependent on the building occupancy and the present method of system operation. Presently, systems are not switched off, except that heating-only and cooling-only systems are shut down at spring and fall switchover. Time clocks were observed on several systems, however few include the pins required to switch equipment off.

The calculations for determining HRS SAV/YR included:

- Present hours of operation for system providing both heating and cooling = 8626 hrs/yr.
- Present hours of operation for system which provides only heating = 5376 hrs/yr.
- Buildings occupied 0700-1700 (10 hrs/day, 5 days/wk)

$$\frac{\text{HRS SAV}}{\text{yr}} = \frac{5376 \text{ hr}}{\text{yr}} - \frac{1920 \text{ hrs ON}}{\text{yr}} = \frac{3456 \text{ hrs}}{\text{yr}} \text{ (heating only system)}$$

$$\frac{\text{HRS SAV}}{\text{yr}} = \frac{8626 \text{ hrs}}{\text{yr}} - \frac{3120 \text{ hrs ON}}{\text{yr}} = \frac{5506 \text{ hrs}}{\text{yr}} \text{ (heating & cooling system)}$$

Buildings occupied 0700-1800 (11 hrs/day, 7 days/wk)

$$\frac{\text{HRS SAV}}{\text{yr}} = \frac{5376 \text{ hrs}}{\text{yr}} - \frac{2912 \text{ hrs ON}}{\text{yr}} = \frac{2464 \text{ HRS}}{\text{yr}} \text{ (heating only system)}$$

$$\frac{\text{HRS SAV}}{\text{yr}} = \frac{8626 \text{ hrs}}{\text{yr}} - \frac{5512 \text{ hrs ON}}{\text{yr}} = \frac{3114 \text{ HRS}}{\text{yr}} \text{ (heating & cooling system)}$$

Other system variables used in the analysis included:

$$kW/Ton = .915$$
 for chillers

D.7 SIMILAR BUILDINGS

Some of the buildings in the study were very similar to each other. The same basic design was reused numerous time with only slight modifications. When this occurred the building energy analysis could be performed only once on a representative building. The results are applied to the other similar buildings.

The groups of similar buildings are listed in Table D-6 on the following page. The building analyzed as representative of the group is also indicated.

TABLE D-6 BUILDINGS OF SIMILAR CONSTRUCTION

GROUP NO.	BUILDING ANALYZED	BUILDINGS WITH SIMILAR CONSTRUCTION	BUILDING USE
1	36		Medical Center
2	1750	1240	Motor Repair Shop
3	2060	2050, 2072, 2074, 2070	Mnt Hangar Avum -Hangar Zone
4	2060		Mnt Hangar Avum -Ops Zone, 24-Hour Ops
5	2065		AF Ops building 24-Hour Ops
6	2065		AF Ops building Admin
7	4230		Mini-Mall w/ Gas
8	4305	10050	Physical Fitness Center
9	4530		SMA Building
10	10000		DIV CMD/CNTL Building
11	10205		Dental Clinic
12	10207	10502	Exchange/Club
13	10506		Clinic W/O Beds
14	10522	30, 173, 175, 4422, 4432, 4412, 4414, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Admin
15	10522	30, 173, 175, 4412, 4414, 4422, 4432, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Barrack
16	10550	30, 175, 4450, 10150, 10250, 10450, 10650	Enl Pers Din

TABLE D-6 BUILDINGS OF SIMILAR CONSTRUCTION

(Concluded)

GROUP NO.	BUILDING ANALYZED	BUILDINGS WITH SIMILAR CONSTRUCTION	BUILDING USE
17	10630	119, 174, 4400, 4410, 4420, 4430, 10100, 10110, 10120, 10130, 10200, 10210, 10220, 10230, 10400, 10410, 10420, 10500, 10510, 10520, 10610, 10620, 10640	Bn HQ Bldg
18	10670	4475, 4485, 4486, 10170, 10270, 10470, 10480, 10570, 10580, 10660, 10680	Veh Mnt Shop
19	10715		Post Safety/LEA 1st Floor
20	10715		Post Safety/LEA 2nd Floor
21	10730		Clo Sales/Retail/ Commissary
22	10745	4325, 4330, 10790, 10785	Child Support Center
23	10785	4405, 10030	Chapel/Rel Ed/ Child Care Cnt -RE/CC Zone
24	10785	4405, 10030	Chapel Zone
25	10785	4405, 10030	Chapel Offices Zone
26	11050		Clinic W/O Beds/ Supply/Incin- Non-Emergency
27	11050		Clinic W/O Beds/ Supply/Incin- Emergency
28	2060	2050, 2070, 2072, 2074	Mnt Hangar Avum-Ops Zone M-F 0600-1700

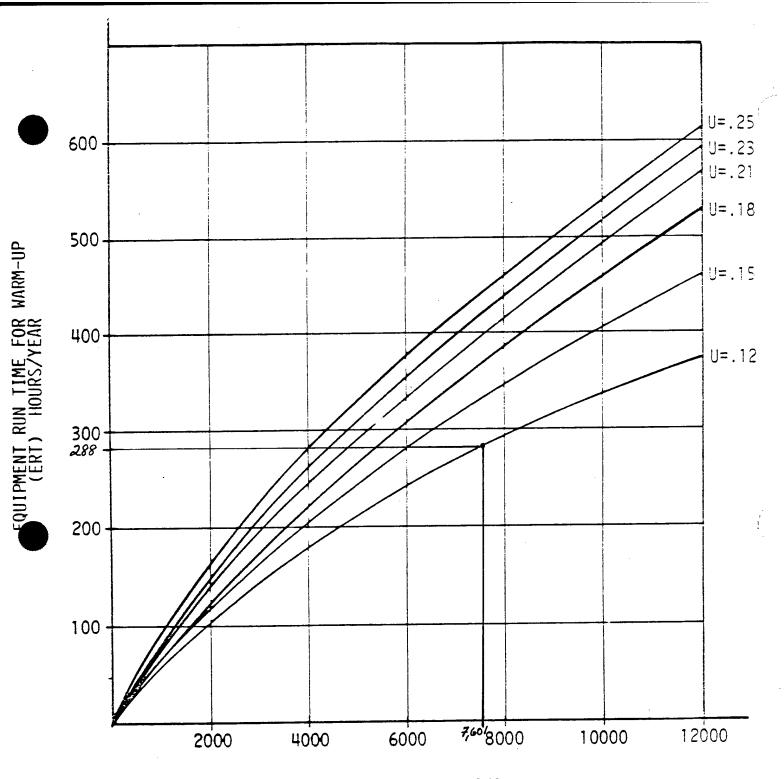
D.8 MANPOWER SAVINGS

The estimated manpower savings for each type of system is based on the size, type, and operation of the system. The manpower savings per system resulting from remote monitoring for smaller systems is estimated to be about three hours a year. The savings for large system, such as large chillers and boilers, is estimated to be about six hours per year. The estimated manpower hours savings, estimate for each type of system used in the analysis, are given in Table D-7 below.



TABLE D-7 MAINTENANCE MANPOWER SAVINGS

SYSTEM NO.	SYSTEM TYPE	MANHOURS
1	H&V UNIT W/O RETURN FAN	3
2	H&V UNIT	3
3	SINGLE ZONE AHU W/O RETURN FAN	3
4	SINGLE ZONE AHU	3
5	SINGLE ZONE AHU W/ HUMIDIFICATION	3
6	MULTI-ZONE AHU	6
7	VAV AHU	6
8	CHILLER AND PUMPS	3
9	CONVERTER AND PUMPS	3
10	HOT WATER BOILER AND PUMPS	3
11	CONDENSING UNIT	3
12	PERIMETER RADIATION CONV. & PUMPS	3
13	STEAM HUMIDIFICATION	3
14	VENTILATION UNIT	3



HEATING DEGREE DAYS

HEAVY CONSTRUCTION FIGURE 10

APPENDIX E HVAC SYSTEM ECONOMIC SUMMARY

SYSTEM SAVINGS DESCRIPTIONS

System

1. H&V Unit Without Return Fan

Function and Manpower Savings

- 1 Scheduled Start/Stop Control Optimum Start/Stop Control Demand Limit Night Set Back Forced Ventilation
- 2 Economizer
- 3 DDC
- 4 Manhours
- 2. H&V Unit

Function and Manpower Savings

- Scheduled Start/Stop Control
 Optimum Start/Stop Control
 Demand Limit
 Night Setback
 Forced Ventilation
- 2 Economizer
- 3 DDC
- 4 Manhours
- 3. Single Zone AHU Without Return Fan

Function and Manpower Savings

- Scheduled Start/Stop Control Optimum Start/Stop Control Demand Limit Night Setback Forced Ventilation
- 2 Economizer
- 3 DDC
- 4 Manhours

4. Single Zone AHU

Function and Manpower Savings

- Scheduled Start/Stop Control
 Optimum Start/Stop Control
 Demand Limit
 Night Setback
 Forced Ventilation
- 2 Economizer
- 3 DDC
- 4 Manhours

5. Single Zone AHU With Humidification

Function and Manpower Savings

- Scheduled Start/Stop Control
 Optimum Start/Stop Control
 Demand Limit
 Night Setback
 Forced Ventilation
- 2 Economizer
- 3 DDC
- 4 Manhours

6. Multi-Zone AHU

Function and Manpower Savings

- Scheduled Start/Stop Control Optimum Start/Stop Control Demand Limit Night Setback Forced Ventilation
- 2 Economizer
- 3 DDC
- 4 Manhours

7. VAV AHU

Function and Manpower Savings

- Scheduled Start/Stop Control
 Optimum Start/Stop Control
 Demand Limit
 Night Setback
 Forced Ventilation
- 2 Economizer
- 3 DDC
- 4 Manhours

8. Chiller and Pumps

Function and Manpower Savings

- Scheduled Start/Stop Control
 Optimum Start/Stop Control
 Demand Limit
 Night Setback
- 4 Manhours
- 6 Chilled Water Reset

9. Converter and Pumps

Function and Manpower Savings

- Scheduled Start/Stop Control Optimum Start/Stop Control Unoccupied Setback
- 4 Manhours
- 7 Hot Water Reset

10. Hot Water Boiler and Pumps

Function and Manpower Savings

- Scheduled Start/Stop Control Optimum Start/Stop Control Unoccupied Setback
- 4 Manhours
- 7 Hot Water Reset

11. Condensing Unit

Function and Manpower Savings

- 1 Scheduled Start/Stop Control Optimum Start/Stop Control Unoccupied Setback
- 4 Manhours

12. Perimeter Radiation Converter/Boiler and Pumps

Function and Manpower Savings

- Scheduled Start/Stop Control Optimum Start/Stop Control Unoccupied Setback
- 3 DDC
- 4 Manhours

13. Steam Humidifier

Function and Manpower Savings

- 4 Manhours
- 14. Ventilation

Function and Manpower Savings

- 1 Scheduled Start/Stop Control Optimum Start/Stop Control Demand Limit
- 4 Manhours

Table E-1 lists the building summary savings, costs, EMCS points, and building economics for the HVAC systems evaluated.

Table E-2 lists building and HVAC system savings, costs, EMCS points, and economic summary for HVAC systems and functions for all buildings.

TABLE E-1 FORT DRUM, NEW YORK ENERGY MONITORING AND CONTROL SYSTEM

	쭚	100.0	40.0	18.7	16.9	16.7	15.5	15.4	15.4	15.4	15.3	15.2	15.2	15.2	15.7	15.2	13.1	13.0	12.4	12.2	12.2	12.2	12.0	11.8	11.2	11.2	10.6	9.0	8.9	8.8	8.7	8.6	7.9	7.3	7.3	7.2	7.1	6.5	9	58	5.8	5.8	5.7	6.7	5.3	5.3	3.7	7	5.0	5.0	5.0	01
S DISC.	SAVING		825 128	196,528	101,702	410,587	380,055	379,433	378,478	377,708	3/5,451	373,765	3/3,633	372 940	372 910	372.863	507,824	279,562	130,955	128,769	128,645	114,867	254,660	255,739	134,3/9	103 149	98 155	130,451	69,826	126,718	126,454	123,997	193 316	105,765	105,031	104,464	108,808	93,698	99,307	91,326	91,085	227,677	52,971	180,182	55,555	91,189	91,720	46.64B	46 442	83,244	45,871	0F AR
TOTAL BLDG.	COST	3,750	20.433	10,515	6,025	24,559	24,559	24,559	24,559	24,559	24,559	24,559	24,559	24,539	24 559	24,559	38,695	21,480	10,558	10,558	10,558	9,441	21,290	21,670	0.251	9.251	9.236	14,464	7,807	14,464	14,464	14,441	24343	14,464	14,464	14,464	15,237	14,464	15,080	15,773	15,773	39,456	9,236	26,731	10,563	17,341	057.8	200,0	9.236	16,756	9,236	9200
1.71	COST	3,650	8,600	5,450	4,100	9,950	9,950	9,950	9,950	9,950	9,950	9,950	026,6	9,900	9,950	9,950	14,000	9,050	5,450	5,450	5,450	2,000	9,050	9,050	000	5,000	2,000	6,800	4,550	6,800	6,800	6,800	0,030	6.800	6,800	6,800	6,800	6,800	007,7	7,250	7,250	14,450	5,000	10,400	5,450	7,250	2,000	2,000	5,000	7,250	5,000	000
11.00	COST	35	11,833	5,065	1,925	14,609	14,609	14,609	14,609	14,609	14,609	14,609	14,609	14,609	14,609	14,609	24,695	12,430	5, 108	5,108	5, 108	4,441	12,240	12,620	0,033	4.251	4.236	7,664	3,257	7,664	7,664	7,641	14 402	7.664	7,664	7,664	8,437	7,664	8 280	8,523	8,523	25,006	4,236	16,331	5,113	10,091	4,230	4 736	4 236	9,506	4,236	200 1
TOTAL	POINT		72	28	13	/8	87	87	87	87	/8	8/	/8	87	87	87	143	77	31	31	31	25	9/	77	200	24	24	46	19	46	46	47	87	46	46	46	49	46	47	51	51	149	24	96	29	26	24	24	24	53	24	100
₹	POINT		23	12	3	8	8	8	9	30	3	8	8	8 8	8 8	၉	53	24	12	12	12	9	21	24	4 0	9	9	15	7	15	15	री र	28	15	15	15	17	15	2 0	16	16	49	10	37	12	19	2	10	10	19	10	40
ā	POINT	-	17	7	5	8	9	18	18	18	2 :	20 (8 9	· 0	18	18	26	21	5	5	5	5	25	11	7	5	4	1	4	11	11	45	17	==	11	11	77	+ +	<u>n</u> «	16	19	26	4	18	5	13	4 4	2 4	4	13	4	*
Q Y	POINT		21	2	2	52	25	25	25	25	27	52	27	25	25	25	38	2	6		6		16	3.	n «	9	9	13	4	13	13	13	29	13	13	13	14	13	12	11	11	48	9	29	80 9	12	ې و	ی و	9	12	9	4
DO AO	POINT		17	4	8	14	14	14	14	14	4	14	4 6	14	14	14	26	11	5	5	5	5	14	11	۳ ۵	9 6	4	7	4	7	7		13		7	7	7	7	0 00	0 00		2		12	4	12	4 0	8 4	4	თ	4	-
COST			95,420	22,062	10,619	48,295	44,773	44,702	44,593	44,506	44,250	44,059	44,044	43 962	43,962	43,956	58,342	32,741	14,944	14,695	14,681	13,366	27,348	29,886	12,003	12.042	10,387	15,025	8,154	14,599	14,569	14,349	20,220	12,203	12,137	12,073	12,015	10,854	10.361	10.217	10,192	26,070	5,680	20,228	6,474	10,588	0,409 0,007	5.347	5.323	9,653	5,259	5 200
- 11 - 1	PER YR		57	15	o (42	42	42	42	42	42	4.5	24	74	42	42	45	33	15	15	15	15	45	42	2 0	12	12	24	12	21	21	33	3 8	21	21	21	27	21	24	8	30	78	12	39	18	24	71	12	12	24	12	45
MBRU LPG SAVING	PER YR																																																			
F. OIL #2 SAVING	PER YR			2,007	2,444																		4,778	טטניני	7,230		2,115					1 7/13	2				1,454	7	<u>,</u>	988	982		1,009	1,827	Š	23	1 214	1,2,1		23		
District Htg	PERYR		11,235			983	521	202	481	461	403	328	355	337	337	336	6	-		2				1,704	760	260		2,110	492	2,027	2,020		3,336			1		1,161	1 680	2		4,514			465	900	C76	897	892	884	877	REG
KWh	PER YR		817,033	241,752	737	788,324	761,142	761,142	/61,142	761,142	761,142	761,142	764 142	761 142	761.142	761,142	318,367	467,997	33,152	32,954	32,954	147,255	111,928	393,625	154 468	154,468	21.020	95,778	103,080	95,778	95,778	115,525	123 108	87,483	95,778	95,778	95,778	97,154	45 212	98,973	98,973	82,028	21,020	206,680	74,210	104,469	71,020	24 020	21,020	88,627	21,020	24 020
Library (1) Fata Andria	PER YR		9																			33							15			27	2									11		54		48				48		
BLDG	DESCRIPTION	ELEC SUBSTATION	SMA BUILDING	PHYS FITNESS CENTER	TOE MAINT	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	PHYS FIT CENTER	CHILD CARE CNTR	CHILD SUPPORT CENTER	YOUTH CENTER	SKILL DEV CENTER	DENTAL CLINIC	MNT HANGER AVUM	CLO SALES STORE & EXCH MAIN	MOLIOR KEPAIK SHOP	UNIT CHAPEL	OHOO.	BRKS & MESS HALL	CLINICS W/O BEDS	ENL PERS DIN	ENL PERS DIN	ADP BUILDING	ENI PERS DIN	OPEN DIN NCO	ENL PERS DIN	ENL PERS DIN	BRKS & MESS HALL	ENL PERS DIN	MINI HANGEK AVOIM BN HO BI DG	MNT HANGER AVUM	WSAAF HANGAR	DIV CMD/CNTRL BLDG	BN HQ & CLASSROOM	MEDICAL CENTER	POST SAFETY/LEA		MANT HANDERS AND MANTER AND MANTE	MINI HANGER AVOIN	BN HO BI DG	OPEN DIN CONSOL	BN HQ BLDG	ברום הנו ואם
BLDG.	Ş.	1/6	4530	4305	1240	4475	10670	10660	10680	4485	104/0	10480	4486	10300	10270	10570	10050	10785	10745	10790	4325	10205	2070	10730	1/50	4405	174	175	10506	10250	10150	10690	10550	4350	4450	10650	30	10450	20/4	2050	2049	10000	119	36	10715	10207	4400	10130	10620	10502	4420	1410

TABLE E-1 FORT DRUM, NEW YORK ENERGY MONITORING AND CONTROL SYSTEM

	SIR	4.9	4.8	4.8	0 0	ο α	4	η α	8 4	8 4	4.8	4.8	4.8	4.5	C 4	4 ×	5 0	3,8	3.4	3.4	3.4	3.3	υ c	3.2	3.1	, m	3 1	3.1	3.1	3.1	3.1	2.9	2.3	2.4	2.4	2.4	7.4	3 6	23	2.3	2.3	2.3	2.3	2,0	22	21	1.9	4	9.0	0.5	0.1
ں ہے		31,315	44,418	44,418	44,418	44,410	44 418	44 418	44 418	44.418	44,414	44,414	44,414	41,278	41,278	077	83.908	088	3,400	3,783	48,339	3,052	306	2887	45.083	1,734	44 710	44,485	1,477	44,477	44,236	18,925	77,77	26,445	26,445	26,375	3/2	5,687	25,598	25,598	5,524	16,084	25,062	12 014	75,673	3.057	20,745	14,372	2,829	534	644
TOTAL DISC	S						L	L									\perp		F	86	4	4	4	4 5						4				7	76	5 5	L	\perp	L		5,	۶	70	4 +	2	5	2	-			
TOTAL BLDG	COST	6,415	9,236	9,236	9,230	9,236	9276	9 236	9.236	9.236	9,236	9,236	9,236	9,236	9,236	0.2,8	21.043	13,873	5,341	24,479	14,380	14,380	14,380	14,380	14,380	14,380	14,380	14,380	14,380	14,380	14,380	6,564	13,300	11,104	11,104	11,104	10,104	1 104	11,104	11,104	11,104	7,085	1,104	5 861	11 843	11.104	11,104	10,026	4,444	5,450	4,444
SLDG.	COST	4,100	2,000	2,000	000	2,000	5,000	2,000	5,000	5,000	5,000	5,000	2,000	2,000	000,4	200	8 600	6,350	3,650	9,950	6,800	6,800	0,800	000	089	900	6,800	6,800	6,800	6,800	6,800	4,100	000	5,450	5,450	5,450	2,420	5,450	5,450	5,450	5,450	4,550	5,450	0,430	2,500	5.450	5,450	5,000	3,650	3,650	3,650
SLDG.	. Z 13	2,315	4,236	4,236	4,230	4 236	4.236	4 236	4.236	4,236	4,236	4,236	4,236	4,236	4,230	4 236	12,443	7,523	1,691	14,529	7,580	7,580	080,7	7.580	7,580	7,580	7,580	7,580	7,580	7,580	7,580	2,464	7,580	5,654	5,654	5,654	2,034	5,654	5,654	5,654	5,654	2,535	5,654	1 761	5.943	5,654	5,654	5,026	794	1,800	794
TOTAL	الصند	13	24	77	77	24	24	24	24	24	24	24	24	24	24	24	70	44	8	88	46	46	φ φ	9 4	46	94	46	46	46	46	46	7 5	46	31	31	33	5 6	3	31	31	31	15	5 6	20	33	34	31	25	3	8	3
- -	L	2	9	2 5	2 5	2 0	9	9	9	9	9	10	9	2	2 5	2 6	27	14	2	52	7	= ;	= =	7	12	12	12	17	17	17	17	<u>- t</u>	12	13	13	5	5 5	3 5	13	13	55	5	5 5	2 K	3	13	13	15	e 1	S,	3
5	۲	3	4	4	1	4	4	4	4	4	4	4	4	4	4 4	7	12	14		24	6	o (D) C	n o	0	6	6	6	6	6	o o	٥	0 0	4	4	4	4 <	4	4	4	4	4	4 4	1 -	- 5	4	4				
Ą	-	3	9	0 4	0 4	9	9	9	9	9	9	9	9	ه و	ی ه	9 6	22	6	3	20	=	= ;	= =	F	Ξ	1	=	1	11	Ξ	Ξ	4 0	+	9	10	9 9	2 5	9	9	우	9	۳ ر	2 5	2 0	10	9	10	10	1	9	
8	-	2	4	7 4	1 4	4	4	4	4	4	4	4	4	4 4	7	4	6	7		20	o (o (» o	ŋσ	6	6	6	6	6	6	6	ď	0	4	4	4	1 <	4	4	4	4	m •	4 4	+	- 2	4	4				
COST		3,590	5,094	2,034	2,034	5,094	5,094	5,094	5,094	5,094	5,093	5,093	5,093	4,737	4,737	4 737	9,775	5,581	2,096	9,129	5,568	5,535	5 304	5 245	5,198	5,158	5,156	5,130	5,129	5,129	5,102	2,156	4,450	3,026	3,026	3,018	2,010	2,940	2,930	2,930	2,922	1,831	2,869	1 472	2,933	2.642	2,379	1,593	308	293	75
HOURS		φ :	12	17	12 C	12	12	12	12	12	12	12	12	71 \$	100	12	39	33	12	75	36	98	36	38	38	38	36	36	36	36	36	12	38	21	21	23	2 17	21	21	21	21	6	217	9	21	21	21	33	9	6	3
LPG SAVING																																										9						134			
F. OIL #2 SAVING	-1	188																993		1,315																								-					44	1	
District Htg I		0,0	840	040	840	840	840	840	840	840	840	840	840	750	759	759	713		421		750	727	999	989	929	299	999	099	099	099	654	434	506	525	525	523	509	505	203	503	501	7007	489	292	502	438	378			26	3
KWh		48,793	020,17	21,020	21,020	21,020	21,020	21,020	21,020	21,019	21,020	21,020	21,020	21,020	21,020	21,020	106,964	12,720		22,303	27,388	27,388	27.388	27,388	27,388	27,388	27,388	27,388	27,388	27,388	27,388	56 300	27,388	5,337	5,337	5,337	5,337	5,337	5,337	5,337	5,337	19,885	5,337	1 187	5,467	5,337	5,337				
kW SAVING	PER YR																			119																						2									
BLDG		RECREATION CNTR	BN HG BLDG	BN HO BLOG	BN HO BI DG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BUE HO BLUG	RRIGADE HO BI DG	BRIGADE HO BLDG	DOL WAREHOUSE	MINT HANGER AVUM	ENL BK W/O DIN	AF OPS BLDG	BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	EN BK W/O DIN + ADM & SLIPPLY	ENI BK W/O DIN + ADM & SUPPLY	BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	BK W/O DIN + ADM & SUPPLY	MINI MALL WIGAS	ENL BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SLIPPI Y	ENL BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	CLASS VI	ENL BK W/O DIN + ADM & SUPPLY	AMMO INSPECTION	ENL BK W/O DIN + ADM & SUPPLY	BK W/O DIN + ADM & SUPPLY	ENL BK W/O DIN + ADM & SUPPLY	MAIN WASH	BARRACKS	FIRE STATION	EMTOMOLOGY FAC
BLDG.	Š.	4330	10420	10520	10640	10120	4430	10410	10610	10630	10210	10230	10220	10400	10100	10200	4525	2060	4422	4	4		10234 EN	1	1		L	Li	Ц		4	4432			Щ	10224 EN	_	Ц.			4		10524 EN		1	L		21510	173	10710	11142

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SIMPLE	M/A	0.4	1.4	NA	0.4	1.2	0.4	N/A	1.3	0.3	0.8	NA	N/A	2.0	0.7	NA	1.3	12.5	NA	0.5	N/A	N/A	16.4	15.8	N/A	0.7	9.5	N/A	N/A	0.5	13.4	12.6	N/A	0.3	0.3	8.8 8.8	NA.	1.1	N/A	10.0	10.U	11		7.0	DIAM	V/N	20	7.8	0.7	NA
<u>8</u> 7.	V/V	216	7.1	ΑΝ	20.1	8.2	20.8	N/A	7.2	32.0	11.5	ΑN	N/A	4.8	13.5	ΑX	6.8	0.8	ΑN	18.2	N/A	N/A	0.6	0.6	N/A	13.2	1.0	N/A	Ν	18.9	0.7	0.7	ΑN	27.2	29.5	0.5	¥ 1	?	AN C	9.0	9.0	7 7 7	0 00	1 1	- VI	1 0	V 0	1.0	38.9	A'N
TOTAL 5 DISC. SAVING	512	13 053	2,573	512	15,207	2,961	15,719	512	2,614	24,169	4,182	512	512	1,744	10,174	512	4,099	278	512	5,254	1,290	512	453	431	512	7,994	522	512	1,024	13,759	1,122	1,187	1,024	19,825				4	26	710	212	7 345	24 034	1 800	1,033	1,024	1/10/1	739	14.917	512
BLDG. INST. COST		604	363		756	363	756		363	756	363			363	756		604	363		289			773	773		604	534			728	1,698	1,698		728	728	1,698	013	8/6	8	709	905	578	202	4 608	060'-		283	505	383	
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COST SAVING PER YR	9	1.442	268	09	1,681	308	1,755	09	272	2,693	436	90	09	182	1,134	09	473	29	09	571	134	09	47	49	99	876	26	09	120	1,557	127	135	120	2,273	2,466	193	071	715	- 8	2 8	3	512	7 364	2,301	120	2 6	1 55g	77	1.558	09
LABOR HOURS SAVING PER YR	٣			3				3				3	3			3			3			တ			3			3	9				ဖ			6	0		(2 (2				ď	٣	2			ю
MBW LPG SAVING PER YR																																																		
MBKU F. OIL #2 SAVING PER YR		174.40	63.00		200.80	72.50	177.20		64.00	283.50	102.40			42.70	118.10		18.90	6.80		87.40	31.60		11.10			118.60	9.60			118.60	9.60	9.60		118.60	118.60	9.60							24A AD	47.30	17.30		357 40	18 10	357.40	
MBW District Htg SAVING PER YR	\$ 100 may 18.7																							11.10																										
KWh SAVING PER YR		12,801.70			15,122.30		18,308.00			27,177.00					11,550.20		7,181.90			3,637.00						6,406.50	281.50			18,319.60	1,576.10	1,715.00		30,575.80	34,101.50	2,174.40	0 040 60	0,010.50	01.88.10		400 40	8 010 50	25 126 20	2 574 30	2,074.00		603 BO	20.000	694 00	
KW SAVING PER YR																										3.1				7.3				13.9	13.9		40.0	8.01				401	40,	2						
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SYSTEM EMCS NUMBER FUNC.	-	-	-	2	2	2	2	2	2	2	2	2	2	2	2	-	-	-	12	6	6	6	6	6	6	3	3	3	9	9	9	9	9	9	9	ه ه	0 0	Σ (0	ρ (0	οα	0	0 4	2 6	9 0	2 0	2 6	10	9
SYSTEM	AHI 11	AHU1	AHU1	AHU2	AHN2	AHU2	AHU3	AHU3	AHU3	AHN4	AHN4	AHU4	AHU5	AHU5	AHU5	AHU6	AHU6	AHU6	FTR1	Ή	Ή	Ή	丑	HE1A	HE1A	AC1M	AC1M	AC1M	AC2M	AC2M	AC2M	AC3M	AC3M	AC3M	AC4M	AC4M	AC4IN	ACCIM PCCIM	ACCIM	ACCIM	ACC2M	ACC2M	VEI 14	A 10 14	AH 14A	בַּלְ	ā	2 2	<u> </u>	82
BLDG DESCRIPTION	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENIER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICALOGNIES	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTED	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER
BLDG NO.	06	3 8	8	30	30	30	30	30	93	30	30	30	30	30	30	30	30	93	30	30	30	30	30	30	30	36	36	36	36	36	36	36	99	38	38	98	8	98	98	36	98	S &	3 8	ફ દ	ဂ	ဂ	8 8	98 %	တ္က ဗ	8 %

шŠ	20 (14./	7 Y	5 0	X	92.6	0.2	ΑN	2.0	Ϋ́	0.5	5.6	≸	4.	29.4	3.2	X	2 0	5.0	3.2	2 2	16.7	=	¥	95.6	¥	0.2	0.1	1.2	¥ ;	4.0	£ 3	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	0.3	ΑX	N/A	0.3	0.8	0.2	0.5	ΑN	0.5	1.2	₹ !	17	¥ S	8.2	Ž
SIMPLE																																																
S. R.	7.) o	A Z	4 8	¥	0.1	51.6	X.	4.7	NA	19.8	1.7	¥	6.2	0.3	3.0	Y S	¥ 2	7.87	0.5 0.5	Y Z	90	8	× ×	0	Ν	54.7	88.8	8.2	YN S	21.0	6.7	12 5	25.2	ΑX	N/A	25.3	10.6	39.2	16.9	N/A	16.5	7.1	¥ :	7.3	¥.		₹ Z
SAVING	(39	23/	210	2,469	512	78	29,722	512	2,218	512	11,951	621	512	3,747	118	che'i	21.0	71.0	300,7	1,080	512	208	4.891	512	78	1,033	15,815	51,162	3,880	512	12,707	2,448	4 355	19.062	512	512	19,120	3,842	29,612	6,150	512	12,442	2,564	512	4,404	512	389	512
BLDG. INST.	905	363	804	289		773	576		472		604	363		904	363	700		100	900	503		363	604		773		289	576	472		604	363	263	756			756	363	756	363		756	363		604	000	363	
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HOURS SAVING PER YR		C	?		6			3		3			3	1		c	2	2		c	2 "	,		6						က			2		3	3					က			3	1	3	+	က
LPG H SAVING S PER YR P																																																
F. OIL #2 SAVING PER YR	18.10	2.80	74.50			1.90	700.60		54.30		196.20	15.20		37.40	2.90	44.20		040.00	343.20	70.00		5 10	65.40		1.90	25.30	326.80	1,225.60	95.00								<u> </u>											
Metal District Htg SAVING PER YR																							_								1/4.40	63.00	112 10	310.30			273.80	98.90	438.10	158.30		182.50	99.00		27.70		10.00	
kWh SAVING PER YR			3 083 50	5 328 60			2,397.80				8,501.70			4,791.40				1	6,50Z.UU				4 791 40	2			5,328.60	2,397.80			12,801.70			15 122 30			18,308.00		27,177.00			11,550.20			7,181.90			
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SYSTEM EMCS NUMBER FUNC.	5	-	-	- 0	6	6	12	12	12	-	-	-	-		- 5	2 9	2	717	- -	-	-		-	6	6	თ	6	12	12	12		- -		2 0	, ,	2	2	2	2	2	2	2	2	2	-	-	-	12
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	1	†		+												1		1					T																	П					1	1		
BLDG DESCRIPTION	MEDICAL CENTER	MEDICAL CENTER	MEDICAL CENTER	BN HO & CLASSROOM	BN HO & CLASSROOM	BN HQ & CLASSROOM	BN HQ & CLASSROOM	BN HQ & CLASSROOM	BN HQ & CLASSROOM	BN HQ & CLASSROOM	BN HQ & CLASSROOM	BN HQ & CLASSROOM	BN HQ & CLASSROOM	BN HQ & CLASSROOM	BN HQ & CLASSROOM	BARRACKS	BARRACKS	BARRACKS	8 H S	S 5	2 2	2 2	2 2	2 2 2	요 요	왕	00 HQ	SO HQ	CO HQ	CO HQ	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MFSS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL
BLDG NO.	36	36	36	30				119		119	119	119	119	119	119	173	173	173	174	174	174	174	174	174	174	174	174	174	174	174	175	175	175	1/5	175	175	175	175	175	175	175	175	175	175	175	175	175	175

SIMPLE	PAYBACK	15.8	0.4	NA	¥ N	AN S	2 -	0 0	N/A	0.1	NA	-	0.3	N/A	1.1	0.8	N/A	18.8	5.3	0.2	N/A	9.0	0.4	K/N	N/A	2.3	0.1	10.9	N/A	0.4 N/A	2 6	3.2	N N	N/A	0.4	NA	N/A	1.	1.5	¥ Z	≸ :	- 6	3.3	0.4	N/A	V4.4	1.0	3.9	0.5
	SIR G	9.0	24.0	A/A	A/N	512	2 0	0 0	N/A	148.2	A/N	8.6	25.8	N/A	0.9	11.9	ΑN	0.5	1.8	57.3	ΑN	1.	25.8	N/A	Ν	4.2	79.2	0.0	₹	21.3	2 0	300	¥ N	N/A	24.7	N/A	N/A	8.7	6.2	N/A	¥ ¦	200	6.7	24.8	¥ c	0.4 VA	83	2.5	18.1
TOTAL \$ DISC.	SAVING	431	6,934	512	1,896	542	3.760	3 760	512	↓_	+	3,120	9,887	512	523	6,865	512	241	653	34,585	512	388	15,601	512	512	1,536	47,839	319	512	12,8/3	2 649	2 8	512	466	9,461	512	512	6,568	4,689	512	512	6,568	8CD, 1	18,760	210	143	6.299	068	13.647
TOTAL BLDG. INST.	3 E 2 E	773	289			100	383	383	3	604		363	383		602	276		472	363	604		363	604			363	604	363	1	604	CUS	602	3		383			756	756			726	303	8	000	363	756	363	756
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LABOR HOURS SAVING	PER YR			က		c	2		(*	,	3			3		- "	3				3			3	3				3	·	n		С.			3	3			က	က			•	3	c	,		
MBtu LPG SAVING	PER YR																																																
MBtu F. OIL #2 SAVING	PER YR						88 80	88 80	00.00	2 190 40	2	76.40			12.80	168.10		5.90	16.00	459.60		9.50	272.00			37.60	1,078.40	7.80		222.20	44.40	44.40	2	11.40	59.80			142.30	100.00			142.30	25.90	135.80		3.50	18 10	21.80	114 50
MBtu District Htg SAVING	PER YR	11.10	135.10		48.80																																												
KWh	PER YR		3,637.00				787 50	287.50	00.102	162 00	201		21,339.80							34,135.30			9,697.90				8,198.40			8,198.40					15,149.40			1,633.70	1,307.00			1,633.70		28,521.20			12 000 60	14,000.00	19 363 70
KW	PER YR																																																
EMCS	FUNC.	7	1	4	3	•	7	- -		-	- 4	3	-	4	7	-	4	3	3	1	4	9	1	4	4	3	-	3	4			,					4		-	4							4 -		
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SYSTEM	21 24 S. 1 N	E1	吊	HE1	Ē	ELEC	ā ā	ã	29	HZ F	ξ	ξ	H-	P-1	1 4	FTR-1	FTR-1	FTR-1	HV-1	HV-1	HV-1	HV-2	HV-2	HV-2	HV-3	HV-3	HV-3	HV-4	HV-4	₹	- h	- c	2-0	FTR-1	FTR-1	FTR-1	HV-1	₹-\ 1-\	HV-2	HV-2	HV-3	H-3	HV-4	₹ 4	HV-4	HV-5	۲۰ ۲۸	7 2 2 1	9/1
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BLDG	DESCRIPTION	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	BRKS & MESS HALL	ELEC SUBSTATION	TOT MAIN!	TOT MAIN!	TOE MAINT	TOE MAINT	TOF MAINT	TOF MAINT	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	MOTOR REPAIR SHOP	WSAAF HANGAR	WSAAF HANGAR	WSAAT HANGAN	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	AVONAL HANGAN
		175 B		175 E			40	1240	1240	1240	1240	1240		_			_					1750 M					1750 M	1750 M			2049	2049	2040	2043	2049	2049	2049	2049	2049	2049	2049	2049	2049	2049	2049	2049	2049	2049	2049
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SIMPLE	ΑN	0.5	4.5	N/A	3.2	N/A	3.2	N/A	N/A	0.4	N/A	AN.	L.T	0.5	4 *	VIV	V V	40	6.6	N/A	24.4	1.0	0.5	Ν	3.9	4.5	N/A	0.5	4.0	Y/2	A D	A N	16.3	2.1	A/A	2.0	N/A	-	N/A		¥ +	D/N	1	NA	N/A	1.1	1.1	N/A
SIR P S	K N	17.2	2.1	N/A	3.0	N/A	3.0	A/A	N/A	24.8	N/A	N/A	ς ς	2.0	N/A	0 0	Z A	24.9	2 6 6	Α.Χ	0.4	8.3	18.1	N/A	2.5	2.1	N/A	17.3	2.4	Y/2	N/A	NA N	9.0	4.7	N/A	4.7	N/A	8.4	A/A	8.4	ξ τ α	A/N	8.4	N/A	N/A	8.4	8.4	N/A
TOTAL \$ DISC. SAVING	512	13,018	772	512	1,813	512	1,813	512	470	9,490	512	512	6,368	4,009	210	512	512	18 875	1 070	512	143	6,307	13,700	512	903	780	512	13,067	1,450	212	1 450	512	278	1 699	512	3,526	512	6,343	512	6,343	210	512	6.343	512	512	6,343	6,343	512
BLDG. INST. COST S.		756	363		602		602			383		7	750	000/	756	000		756	363		363	756	756		363	363		756	602		CUS	700	472	363		756		756		756	756	3	756			756	756	
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HOURS SAVING PER YR	3			3		3		က			e (77		C	2	٣) m	,		6				3			9		,	2 6	2	6			3		3		6	,	2	c		9	3			3
LPG SAVING PER YR																																																
METU F. OIL #2 SAVING PER YR		99.10	18.90		44.40		44.40		11.50	60.50		147.20	142.30	100.00	142 30	142.30		137.40	26.20		3.50	18.30	115.80		22.10	19.10		100.30	35.50		35.50	8	6.80	41.60		74.10		133.30		133.30	133 30	25.55	133.30			133.30	133.30	
mbtu District Htg SAVING PER YR																																																
KWh SAVING PER YR		19,363.70								15,149.40		4 622 70	1,003,70	00.706,1	1 633 70	0.7.000,1		28 521 20				12,000.60	19,363.70					19,363.70								1,079.50		1,940.10		1,940.10	1 040 10	2000	1.940.10			1,940.10	1,940.10	
KW SAVING PER YR																																																
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SYSTEM EMCS NUMBER FUNC.	2	2	2	2	9	10	9	10	9	9	9	7 (7 0	7 (7 0	2	2	,	2	2	2	2	2	2	2	2	2	2	9 9	2 \$	2 5	12	12	1	-	2	2	2	2	2	2 6	2	2	2	2	2		
SYSTEM	HV-6	HV-7	HV-7	HV-7	B-1	B-1	B-2	B-2	FTR-1	FTR-1	FTR-1		- 2	7-12	7-10	2 2	14.4 14.4	HV-4	HV-4	HV-5	HV-5	HV-5	9-AH	9-/\H	9-AH	L-VH	7-VH	HV-7	4	- C	2-8	FTR-1	FTR-1	H-1	₹-1	MAU-1	MAU-1	RMAU-1	RMAU-1	RMAU-2	2-DAMP	PMALL3	RMALL4	RMAU-4	RMAU-5	RMAU-5	RMAU-6	RMAU-6
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BLDG	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	WSAAF HANGAR	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNI HANGER AVUM	MINI HANGER AVON	MINI HANGER AVOIN	MINI HANGER AVOW	MINT HANGER AVUM	MINT HANGER AVIIM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MINT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNI HANGER AVUM	MINT HANGER AVOM	MINT HANGER AVIIM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MINI HANGER AVOM	MINI HANGER AVOIM	MNT HANGER AVIM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MINT HANGER AVUM	MINT HANGER AVUM
BLDG NO.	2049	2049	2049	2049	2050	2050	2050	2050	2050	2050	2050	2050	7020	ngnz	0007	7050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2050	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	0907	2060	2060	2060	2060	2060	2060	2060

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SIMPLE	PAYBACK	N/A	12.0	12.0	N/A	12.0	N/A	12.0	NA	N/A	12.0	N/A	3.2	N/A	12.0	NA	NA	8.1	N/A	30.0	30.0	N/A	30.0	N/A	N/A	30.0	NA	30.0	NA	AN C	30.0	7.CI	15.2	N/A	5.7	1.4	NA	N/A	1.9	0.5	N/A	40	NA	1.0	4.2	N/A	AN C	
	S.	N/A	0.7	0.7	ΑN	0.7	N/A	0.7	ΑN.	Y Z	0	A G	2.6	N N	0.7	NA	N/A	1.0	N/A	0.3	0.3	¥,	0.3	Z Z	S N	0.3	ΑX	0.3	ΑX	KN C	500	0 0	0.6	N/A	1.7	6.9	Υ×	Y.	5.0	20.6	4 4 A	2.0	AN N	9.6	2.3	¥ N	₹	2
TOTAL \$ DISC.	SAVING	512	428	428	512	428	512	428	512	212	428	212	1,590	512	428	512	512	634	512	82	82	512	82	212	512	82	512	82	512	512	78	512	380	512	909	5,218	512	512	1,809	15,555	12 676	870	512	7,240	833	331	512	1 2 7
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LABOR HOURS SAVING	PER YR	3			3		3	(20 0	5	·	0		6		3	3		3			6	·	8	.3		3		က	9		٣		3			3	3		C	n		3				3	
MBtu LPG SAVING	PER YR																																															
F. OIL #2	PER YR																														000	9.30	9.30		14.90	124.50			44.30	369.40	79.90	21.30		169.50	20.40	8.10	104 00	144.50
MBtu District Htg SAVING	PER YR																																															
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KW	PER YR		7.3	7.3		7.3	;	(.3		7.3	6.)	27.4	27.1		7.3			10.8		1.4	1.4		1.4	77	<u>.</u>	1.4		1.4		,	4.1																	
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SYSTEM	NUMBER FUNC.	3	3	6	က်	3	e	E) (2) (2 6	2 6	2 6	3	33	3	3	3	3	=	=	=	= =	-	F	= =	=	7	11	11	= ;	= \$	2 5	6	10	2	2	2	2	2	7	2 6	2	2	2	2	12	12	1
SYSTEM	NAME	AC-1	AC-1	AC-2	AC-2	AC-4	AC-4	AC-4A	AC-4A	A 2	ر د کا د	٩٥٩	AC-7	AC-7	AC-8	AC-8	AC-9	AC-9	ACC-1	ACC-1	ACC-2	ACC-5	ACC:3	ACC.	ACC-4	ACC-5	ACC-5	ACC-6	ACC-6	ACC-7		9 9	B-2	B-2	HV-1	HV-1	₹	HV-2	HV-2	HV-2	7 F F	E-X	HV-4	HV-4	HV-4	HX-1	ž ;	
92	PTION	BLDG	BLDG	BLDG	BLDG	BLDG	BLDG	BLDG	BLDG	500	BLDG BLDG	S G	B 70	BLDG	BLDG	BLDG	BLDG	BLDG	BLDG	BLDG	BLDG	BLDG	BLDG	AF OPS BLDG	2 E C	BLDG	AF OPS BLDG	AF OPS BLDG	S BLDG	AF OPS BLDG	AF OPS BLUG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BI DG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	טבוס
BLDG	DESCRIPTION	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLUG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OP	AF OPS BLDG	AF OPS BLDG	AF OP	AF OP	AF OPS BLDG	AF OP	A S	A P	AF OP	AF OP	AF OP	AF OP	AF OP	AF OP	AF OP	AF OP.	AF C	AF OP	AF OP	AF OP	AF OP	AF OP	AF OP	Ę) TK
BLDG	ğ	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2002	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2002	2065	2065	2065	2065	2065	2002	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2065	2002

SYSTEM SUMMARY LISTED BY BUILDING	
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14 0 0	PAYBACK	¥/2	† 8 Z	3	0.5	N/A	2.9	2.9	N/A	NA	0.1	0.3	0.7	N N	0.2	NA	2.8	0.7	9.0	A/A	¥ Z	0.7	0.9	A/A	6.0	K C	8.5	ζ σ 2 c	X X	N/A	0.9	0.9	N/A	NA C	9.0 V/V	60	NA	3.2	3.2	NA	NA	3.2	0.7	2.5	03	2.0	N/A	N/A
	SIR	¥ 0	0.0	29.0	18.3	A N	3.4	3.4	N/A	Ν	144.7	34.1	13.2	N/A	56.6	NA	3.5	13.7	15.0	Α X	ĕ,	14.4	10.8	N/A	10.8	¥ 0	0.0	10.0	Q M	ΑX	10.8	10.8	A/A	NA N	10.8 N/A	10.8	NA	3.0	3.0	N/A	A/A	3.0	12.2	9.5	34.1	4.7	ΑΝ	N/A
S S	<i>/</i> A	710	543	10 536	7.019	512	2,022	2,022	512	512		12,386	4,807	512	34,205	512	1,262	8,301	11,375	512	512	10,912	8,201	512	8,148	212	0 5 5	212 8 148	512	512	8,148	8,148	512	512	8,148	8 201	512	1,813	1,813	512	512	1,433	7,019	1,409	20 614	3,526	512	512
BLDG.		5	3	363	383		602	602			604	363	363		904		363	604	756			756	756	1	756	750	80	756	3		756	756			92/	756	3	602	602			472	576	363	604	756		
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COST	PER YR	8 8	807	1 798	829	09	211	211	09	09	9,455	1,290	501	90	3,688	99	131	888	1,195	9	8	1,149	867	8	861	09	108	9	3	8 6	861	86.	90	90	861	R67	8	189	189	90	09	149	829	147	2 334	374		
HOURS	PER YR	2	•	2		67			3	3		į		3		က				3	3			3		9	(5	C.	0 (1)			3	3		3	3			3	3				3		3	3
MBtu																																																
MBtu F. OIL #2	30 F		00.Fe	258 00	200.00		49.50	49.50			1,519.50	303.30	117.70		617.90		30.90	161.90	260.00			245.20	178.80		177.50		1/7.50	477 ED			177.50	177.50			177.50	178 BD	0.0	44.40	44.40			35.10		34.50	70, 101	74.10	į	
MBtu District Htg	PER YR																																															
KWh	SAVING PER YR				15 149 40	2, 2,					54,673.90				19,363.70			3,646.30	1,633.70			1,940.10	1,940.10		1,940.10		1,940.10	07.070	1,940.10		1 940 10	1,940,10			1,940.10	4 040 40	94						15,149.40		20 524 20	1 079 50	2.5.2.	
ΚW	SAVING PER YR																																														4	
	EMCS FUNC.	4		4 (0 +	- 4	7	7	4	4	-	3	3	4	1	4	3	-	-	4	4	1	*-	4							1 -				2							3	1				2 0	
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	SYSTEM	MU-1	MU-1	MU-2	MU-2	ā 6	- L	B-2	B-2	₹ 1-	₹-Y-1	HV-1	HV-2	HV-2	HV-2	₹.3	£-3	F	MAU-1	MAU-1	MAU-2	MAU-2	RMAU-1	RMAU-1	RMAU-2	RMAU-2	RMAU-3	RMAU-3	RMAU-4	TAMAC-4	C-UAMA	RMAU-6	RMAU-6	RMAU-7	RMAU-7	RMAU-8	KMAU-8	6	2 2	5 6	FTR-1	FTR-1	FTR-1	H¥-1	₹-	HV-1	MAIL	RMAU-1
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	BLDG DESCRIPTION	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	AF OPS BLDG	MNI HANGER AVUM	MINI HANGER AVOIN	MNT HANGER AVUM	MNT HANGER AVUM	MILIT HANGER AVIIM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MINI HANGER AVUM	MNI HANGER AVUM	MILL HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MINI HANGER AVUM	MINI HANGER AVON	MILL HANGER AVI IM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MINI HANGER AVUM
	BLDG NO.	2065	2065	2065	2065	2070	20/0	0707	2070	0700	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2072	2072	2012	2072	2072	2072	2072	2072	2072	2072	2072

-	1	1	-		-	<i>-</i> -		7	7	T	7	ο.I.	4	n l		<u> </u>	41	7 1-	_1,	01.	712	71_	1 4	-1-0	0	T ₁ O	~	+1	~	10	mI	4	10	41	J.	4 1	01	7 1	<u>ما د</u>	ri c	l m	100	3	9	9	AI.	- 10
SIMPLE		1.1	N/A	1.1	N/A	NA	L.1	7 -		N/A	N/A	3.2	N/A	3.2	9.7	0.5	N/A	W/W	1.1	C.1	4/N	¥ -	- 0	NA N	3.	0.5	N/A	2.4	/N	0.5	3.6	4.4	0.5	N/A	31.	W/N	0.0		0.0	10	15,3	0.8	24.3	9.0			19.5
SIR	8.4	8.4	N/A	8.4	NA	¥ S	δ. A	χ α α	8.4	¥.	ΑΝ	3.0	ΑN	3.0	1.0	16.4	¥ S	A/N	ò	7.0	4/2	ξ α	25.0	S S	3.0	17.3	N/A	4.0	N/A	18.2	2.5	2.2	17.3	¥	0.3	¥ S	2	A O	0 2	2 8	0.6	10.7	0.3	13.9	3.3	¥ I	0.5
TOTAL S DISC. SAVING	6.343	6,343	512	6,343	512	512	543	516	6.343	512	512	1,813	512	1,813	466	9,461	216	710	0,300	4,069	212	210	18 882	512	1,078	13,115	512	1,442	512	13,749	911	788	13,104	512	16/	512	3/1	21C	1,047	8 427	359	900'6	226	11,708	3,306	1,024	1,041
TOTAL BLDG. INST. COST	756	756		756		750	90,	756	756			602		602	472	9/6		750	756	90.7		756	756	8	363	756		363		756	363	363	756		905	0	202	100	904	1 007	647	843	647	843	1,007	000	383
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LABOR HOURS SAVING PER YR			3		3	က	٣	2		6	3	•	က	1		•	2 (0		٢	2 0	2		3			3		က					Э	(£		2	٥							ဖ	
MBtu LPG SAVING PER YR																																															
MBtu F. OIL #2 SAVING PER YR	133.30	133.30		133.30		122.20	133.30	133.30	133.30			44.40	1	44.40	11.40	29.80		442.50	142.30	100.00		142 30	138.80	200	26.40	185.00		35.30		117.00	22.30	19.30	101.20														
MBtu District Htg SAVING PER YR																																			4.30	0	0.0	00 226	08.777	173 50					57.80		7.00
KWIH I SAVING PER YR	1,940.10	1,940.10		1,940.10		1040 40	7,940,10	1 940 10	1 940 10						9	15,149.40		4 623 70	1,033,70	00.706,1		1 633 70	28 521 20	20,021.20		12,000.60				19,363.70			19,363.70					1 108 00	1, 100.90	3 639 00	773.80	19,438.90	486.80	25,270.50	2,289.00	00 070 0	2,246.00
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SYSTEM	RMAU-1	RMAU-2	RMAU-2	RMAU-3	RMAU-3	RMAU-4	DMAU-4	PMALL5	RMALL-6	RMAU-6	B-1	<u>6</u>	B-2	B-2	FTR-1	FTR-1			- 2	7-11	7-1	2 2	2 4	¥4	HV-4	HV-5	HV-5	HV-5	HV-6	9-AH	9-AH	HV-7	HV-7	HV-7	- A	9-1	¥	HV-1	L-VH	AH A	PH4	¥.	AH2	AH2	AH2	AH2	18
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BLDG DESCRIPTION	SER AVUI	SER AVUI	SER AVU	SER AVUI	SER AVUI	SER AVUI	SEK AVUI	SER AVO	FER AVIII	SER AVUI	SER AVUI	SER AVUI	BER AVUI	SER AVU	SER AVU	SER AVU	SER AVU	SEK AVU	SEK AVU	SEK AVO	OFF AVO	GER AVU	GER AVO	GER AVU	GER AVU	GER AVU	MNT HANGER AVUM	GER AVU	GER AVU	GER AVU	MNT HANGER AVUM	GER AVU	MNT HANGER AVUM	GER AVU	AMMO INSPECTION	AMMO INSPECTION	AMMO INSPECTION	AMMO INSPECTION	AMMO INSPECTION	MINI MALL W/GAS	MINI MALL WIGAS	MINI MALL W/GAS	MINI MALL W/GAS	MINI MALL W/GAS	MINI MALL WIGAS	MINI MALL W/GAS	MINI MALL W/GAS
BI. DESCR	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MAIT HANGER AVOM	MINI HANGER AVOIN	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MNI HANGER AVUM	MINI HANGER AVOM	MNI HANGER AVUM	MINI HANGER AVUM	MINI HANGER AVUM	MINT HANGER AVOIN	MINT HANGER AVUM	MINT HANGER AVUM	MNT HANGER AVUM	MNT HAN	MNT HANGER AVUM	MNT HANGER AVUM	MNT HANGER AVUM	MINT HAN	MINT HANGER AVUM	MNT HAN	MINT HANGER AVUM	AMMOIN	AMMO	AMMOIN	AMMO II	AMMOIL	MINIM MA	MINI MA	MINIM	MINIMA	MINI MA	MINI MA	MINI M	MINI MA
8 -	2072	2072	2072	2072	2072	2072	2072	2072	2072	2072	2074	2074	2074	2074	2074	2074	2074	2074	2074	2074	20/4	20/4	2074	2074	2074	2074	2074	2074	2074	2074	2074	2074	2074	2074	2792	2792	2792	2792	2792	4230	4230	4230	4230	4230	4230	4230	4230
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SIMPLE	N/A	3.1	N/A	19.5	11.7	NA	5.8	1.4	N/A	4.9	22.2	N/A	N/A	0.3	0.0	0.4	N/A	3.0	0.0	0.0	0.8	N/A	0.3	0.8	N/A	0.3	N/A	0.3	N/A	00	N/A	0.7	1.2	N/A	0.2	1.3	WN.	16.5	W/N	0.4	1.1	0.4	N/A	N/A	0.4	1.2	0.8	A/N
SiR	ΝΆ	2.7	N/A	0.5	0.8	ΑX	1.6	5.9	ΑN	2.0	0.4	Y.	N/A	30.7	212.3	21.6	A/A	15.0	1.C.	41.7	10.8	N/A	30.1	10.6	N/A	29.7	ΥN	29.7	10.6	40.7	¥.	11.8	8.1	≸ Ž	38.1	6.8	VA VA	9.0	4/X	24.0	8.2	19.3	¥	Ν	19.8	7.2	11.6	Ν
TOTAL \$ DISC. SAVING	512	1,041	512	272	494	512	888	2,242	512	1,135	204	212	512	11,149	160,464	16,345	212	5 503	513	25 204	3 909	512	18,190	3,839	512	17,922	512	17,922	3,839	23 470	512	5,591	4,317	512	23,027	2,597	512	351	716	14,479	2,984	14,583	512	512	14,944	2,630	4,212	512
BLDG. INST.		383		602	602		602	383		929	472		Ġ.	363	756	756	C	263	202	604	363	3	604	363		604		604	303	576		472	534		604	383	000	602	262	503 604	363	756			756	363	363	
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COST SAVING PER YR	9	123	09	31	51	8	133	265	00	118	21	3	09	1,161	18,086	1,857	20 20	66	1 6	2 878	444	9	2,079	436	09	2,049	99	2,049	436	2,673	98	635	450	8	2,684	299	09	37	264	1.670	339	1,684	60	90	1,731	299	478	09
LABOR HOURS SAVING PER YR	8		3			6			3		1	۲ (3			1	3		~	,		3			3		6				6			8			9	(2				3	3				3
MBtu LPG SAVING PER YR																																																
MBTU F. OIL #2 SAVING PER YR					12.10		24.20			27.80	5.00			273.00	1,513.00	128.70	0000	73.20	:														105.70		09.09	13.30		8.60										
METU District Htg SAVING PER YR				7.00														140 70	45.70	452 10	100 60	20.00	386.50	98.80		379.60		379.60	38.80	13.30	20.30	143.90							70.50	79.50	76.80	212.50			187.50	67.70	108.40	
KWh D SAVING PER YR		2,246.00						4,839.10							212,978.90	23,934.00				8 103 00	0,00.00		6,850.00			6,850.00		6,850.00		4 300 BO	00.000				44,359.10	4,433.60				12.801.70	2	13,655.20			16,531.00			
KW SAVING PER YR																																																
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SYSTEM EMCS NUMBER FUNC.	10	10	10	10	9	10	9	6	5	12	12	12	2	2	2	2	2 0	7		-	-	-	-	-	-	1	-	-	- 5	2 C	12	12	က	ဂ	3	9	9	9			2	2	2	2	2	2	2	2
SYSTEM	Б	B2	B2	B2	₽. 1	B-1	B-2	B-2	B-2	FTR-1	FTR-1	FTR-1	HV-1	₹-1	HV-1	HV-3	HV-3	HV-3	-AL		- 27	1 C-VI	H-2	HV-3	HV-3	HV-3	HV-4	HV-4	HV 4	- X	HX-1	¥-	AHU1	AH01	AHC1	3	20	B	AHO1	AHU1	AHU2	AH02	AHU2	AHU3	AHU3	AHU3	AHU4	AHI 14
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BLDG DESCRIPTION	MINI MALL W/GAS	MINI MALL W/GAS	MINI MALL W/GAS	MINI MALL W/GAS	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	PHYS FITNESS CENTER	SKILL DEV CENIER	SKILL DEV CEIVIER	SKILL DEV CENTER	SKILL DEV CENTER	SKILL DEV CENTER	SKILL DEV CENTER	SKILL DEV CENTER	SKILL DEV CENTER	SKILL DEV CENTER	SKILL DEV CENTER	SKILL DEV CENTER	SKILL DEV CENTER	SKILL DEV CENTER	SKILL DEV CENTER	RECREATION CNTR	RECREATION CNTR	RECREATION CNTR	RECREATION CNTR	RECREATION CNTR	RECREATION CNTR	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	ODK NIC NEGO
					"	-	1	"	"	"		-				-	_	_																														4350

TABLE E-2	SYSTEM SUMMARY LISTED BY BUILDING
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SIMPLE	0.3	N/A	1.8	0.7	N/A	11.4	1.3	N/A	0.5	N/A	15.8	N/A	D. C.	0.0	30.0 4 A	S.A.N	A/N	92.3	10	2.1	0.2	NA	N/A	0.1	8.6	N/A	0.2	1.2	4.2	Y C	N/A	47.4	0.5	6.3	NA	32.9	N/A	1.5	1.0	NA	92.3	77	0.2	N AN	1.6	N/A	0.0
8. R	30.5	ΑN	4.8	12.8	N/A	0.8	6.8	N/A	16.2	N/A	9.0	ΑŅ.	1.5	0 0	2 0	S N	AN N	Ç 0	8.5	1.4	45.3	¥ N	N/A	79.5	1.0	ΑN	42.3	7.3	2.1	V α	Į M	0.2	17.4	1.4	NA	0.3	₹ Ž	2.7	8.5	N/A	0.1	ξ α 2	47.5	Y X	5.4	ΑN	8.5
TOTAL S DISC. SAVING	23 025	512	1,756	689'6	512	280	4,104	512	4,679	1,298	431	512	540	10,920	2 553	512	512	74	2,469	1,935	26,070	512	512	60,124	373	512	31,984	2,657	983	7887	512	144	10,482	209	512	97	512	3,467	2,469	512	74	1811	24 477	512	2,359	512	3,077
TOTAL BLDG. INST. COST	756		363	756		363	604		289		773	000	363	200	202	3		773	289	472	576			756	363		756	363	472	£7.6	5	773	604	363		363		90	289		773	472	576	2	433		363
POINT	-		-	-		-	-				7	1	-	-	-	1		2	-	-	2			-	-		-	-		,	1	2	-	-		-		-			2	-	- '	1	-		
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SAVING	2.665	99	199	1,122	09	32	481	9	536	147	49	8 8	1 258	1,200	413	9	90	8	291	220	2,964	09	90	7,029	42	90	3,741	302	112	250	8	16	1,208	58	99	1	8	404	291	8	æ (2	200	2 783	90	279	09	349
LABOR HOURS SAVING PER YR		3			က			3				8				6	6					3	3			8			·	2	m				9		9			e		2		3		3	
MBtu LPG SAVING PER YR																																															
MBtu F. OIL #2 SAVING PER YR					***************************************	-		8			į																																				
MBtu District Htg SAVING PER YR	300.00		45.20	125.00		7.20	20.00		92.50	33.40	11.10	5	170 07	2 70	34.30	2		1,90		49.80	642.40			390.10	9.60		196.90	68.40	75.30	06 20	2	3.70	168.40	13.10		2.50		32.10			1.90	46 60	601 40	2			79.20
kWh [SAVING PER YR	24,540.00			10,429.60			7,181.90		2,343.10				8 501 70	0,100,0	4 791 40				5,328.60		2,397.80			97,058.70			52,521.50			4 888 10			8,501.70					4,791.40	5,328.60				2 397 80	20:100	5,092.00		
KW SAVING PER YR	1000000																																														
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SYSTEM EMCS NUMBER FUNC.	2	2	2	2	-		-	6	တ	6	6					_	6	6	6	12	12	12	2	2	2	2	2	2	172	12	6	6	-	1					σ (o (B C	12	15	14	14	-	
SYSTEM NAME	AHU4	AHU5	AHU5	AHU5	AHU6	AHU6	AHU6	Ή	里	<u></u>	표	AHO1	AHOL	V 1	AHI 12	AHU2	H.	Ŧ	HE1	HE2-PER	HE2-PER	HE2-PER	AHU-1	AHU-1	AHU-1	AHU-2	AHU-2	AHU-2	- E	1 4 H	出 上 上	出土	AHU1	AH01	AH01	AHU2	AHU2	AHU2	<u> </u>	포!	HE) PEP	HE2-PER	HE2-PER	AHU-1	AHU-1	AHU-10	AHU-10
																																												UPPL	UPPL	JPPL	UPP.
BLDG DESCRIPTION	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	OPEN DIN NCO	RGT HQ BUILDING	PGT HQ BUILDING	DOT HO BILL DING	RGT HO RIJII DING	RGT HO BUILDING	RGT HO BUILDING	RGT HO BUILDING	RGT HQ BUILDING	RGT HQ BUILDING	RGT HQ BUILDING	RGT HQ BUILDING	UNIT CHAPEL	UNIT CHAPEL	UNIT CHAPEL	UNIT CHAPEL	UNIT CHAPEL	UNIT CHAPEL	UNIT CHAPEL	INIT CHAPEL	UNIT CHAPEL	UNIT CHAPEL	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HO BLDG	BN HO BLDG	ENL BK W/O DIN + ADM & SUPPI	4412 ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	4412 ENL BK W/O DIN + ADM & SUPPL 4412 ENL BK W/O DIN + ADM & SUPPL
BLDG NO:	4350	4350	4350	4350	4350	4350	4350	4350	4350	4350	4350	4400	4400	4400	4400	4400	4400	4400	4400	4400	4400	4400	4405	4405	4405	4405	4405	4405	4405	2044	4405	4405	4410	4410	4410	4410	4410	4410	4410	4410	4410	4410	4410		4412 ENL	4412 ENL	4412 ENL 4412 FN

SIMPLE	PAYBACK	N A'N	N/A	1.6	1.6	N/A	N/A	1.6	1.1	6.3	N/A	A/N	6.3		A/A	7.	6.3	6.3	N/A	1.1	18.4	46.1	N/A	N/A	N/A	V.V	1.5	9.5	ח פ	N/A	C. A.N	9.5	1.5	1.3	N/A	1.3	A/A	Y.V	18.4	60.4	35.8	2 5	6.2	ΝΆ	N/A	1.5	32.9	1.0	A/N	92.3
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BLDG.	1803			433	433			433	604	363			363	90				363	3	504		(/3							P04	230	SS	363		363		363					1/3	604					363	289		773
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COST SAVING D	2.3	09	90	279	279	09	09	279	569	22	09	99	25	569	9	269	22	25	200	600	9 !	2 8	200	35	8 8	9	413	88	514	20 %	8 8	38	413	277	09	7//2	3	09	16	13	77 6	1217	28	09	09	405	=	291	8	٥
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LPG HC SAVING SA														-																							1		+											
F. OIL #2 SAVING S																								- -						-																				
District Htg F									108.10	13.00			13.00	108.10	0,00	108.10	13.00	13.00	400	100.10	0	3.80	1	7.30			72.80	8.70	72.00	8 70	0.0	8.70	72.80	62.90	;	62.90	-			2.90	4.90	170.60	13.20			32.50	2.50			6
SAVING	אם אם אם אם אם אם אם אם אם אם אם אם אם א			5,092.00	5,092.00			5,092.00	1,683.30					1,683.30	0000	1,683.30			10000	1,003.00	0C.182						1,683.30	18	1,003.30				1,683.30						287.50			8 501 70				4,791.40		5,328.60		
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TABLE E-2	SYSTEM SUMMARY LISTED BY BUILDING
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SIMPLE	15.8	N/A	N/A	0.4	2.1	Z/A	0.4	5 5	0.4	N/A	N/A	0.5	0.4	0.4	N/A	0.2	4.0	N/A	7.9	NA	N/A	9.9	0.2	N/A	13.3	N/A	0.2	9.9	6.6	A C	NA	0.2	13.3	NA	7.9	0.2	0.2	20.1	N/A/A	5.0	0.5	AN C	4.0	5.1
e e	9.0	N/A	Ϋ́	23.3	1 4	1 7 A	20.2	1.6	20.2	N/A	N/A	55.6	2.2	7.7	N N	55.6	2.2	ΑN	-	X S	SS A	1.3	46.7	N/A	0.7	NA AN	46.7	1.3	1.3	V V	N/A	45.2	0.7	N/A		46.2	44 6	0.4	N/A	1.8	15.8	V S	20.2	1.7
TOTAL \$ DISC. SAVING	431	1,243	512	13,414	1,935	1 379	5 846	1,224	5,845	512	512	42,019	808	40 065	512	42,019	804	512	404	212	512	482	28,220	512	241	512	28,220	482	482	212	512	27,276	241	512	404	27,906	26.957	159	512	831	9,101	512	2,846	1,329
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KWIN SAVING PER YR			1	12,616.70			12,617.00		12,616.70		00 4 00	83,884.90		101 035 00		83,884.90				00 000	00,000		56,826.30		56 876 30	20,020,00	56,826.30			56 876 30	20,020,00	56,826.30				56,826.30	56,826.00				12,616.70	1	12,017.00	_
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SIR P	0	O. AV	₹ N	1.0	53.2	N/A	63.7	1.0	ΑN	53.2	1.0	52.3	ΑN N	0.5	9.0	N/A	44.9	ΑN	44.3	0.3	ĕ.	44.9	0.6	44.9	X 4	27.0	A/N	0.3	44.7	N/A	0.5	N/A	23.2	0.2	1.3	Ψ.	14.3	2.0.2	A/N	16	A/N	20.2	52.7	N/A	0.7	0.7	W/N	63.2 N/A
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TOTAL BLDG. INST. COST	277	2		363	756		756	363		756	363	756		363	363		604		604	363		604	363	904	363	3 2	500	363	604		363		604	363	472	Î	5/6	277	2	773		289	756		363	363	, Cir	756
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BLDG DESCRIPTION	PH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAINI SHOP	VEH MAII	VEH MAINI SHOP		VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	WEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	DEN MAIN SHOP	VEH MAINT SHOP
BLDG NO.	4485	4485	4485	4485	4485	4485	4485	4485	4485	4485	4485	4485	4485	4480	4485	4485	4485	4485	4485	4485	4485	500	4480	4400	4485	4485	4485	4485	4485	4485	4485	4485	4485	4485	4486	4480	4480	AABG	4486	4486	4486	4486	4486	4486	4486	4486	4460	4486

SIMPLE	100	0.7	24.0	N N	0.2	0.2	21.1	N/A	ΑN	0.2	41.2	¥ ;	2 - 1 - 2	21.7	0.2	¥	0.2	Ν	41.2	0.2	N/A	24.9	N/A	0.4	63.3	0.4	1.4	X V	0 2	2.1	NA	9.0	0.7	1.3	₹ ¦	7.0	38.8	NA F		74.8	2 \$	¥.	0.8	22.9	Ϋ́	17.5	19.7	NA
1 6 1 1 1 L		, ,	. 4	V	-	9	4	Ä	K	-	2	∢ .	1 (C	2 4	. 9	A	-	⋖	2	4	Ą,	4	Y.	1	-	7	e :	₹ (۵ و	4.2	A	1.0	9	6.7	AN C	0.2	5	N/A	0 4	0.1	- K	N/A	-	4	N/A	0.5	0.4	V/N
S. R.		50.7	0.4	N N	52.1	44.6	0.4	N/A	N/A	44.1	0.2	X X	4.0	4.0	44.6	N/A	44.1	NA	0.2	44.4	N/A					```			0.7 V	4	N/A	1					1		\perp			\perp	Ľ				1	
TOTAL \$ DISC. SAVING	020	20 863	128	512	39,362	26,926	152	512	512	26,627	78	512	2CI 2CO 9C	152	26.926	512	26,627	512	8/	26,825	512	128	512	13,932	51	17,923	2,285	512	13,315	1.507	512	354	8,796	4,026				212	3,383	3,337	512	512	6.108	140	512			512
BLDG. INST. COST	cac	756	363	2	756	604	363			604	363	COC	202	363	604		604		363	604		363		604	363	756	363	1	90,	363		363	756	604		363	303	703	904	363	3		604	363		773	773	
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SAVING	oc	4 707	5 5	09	4,645	3,176	17	90	99	3,142	6	90	3 176	4	3.176	09	3,142	99	6	3,165	09	15	09	1,644	9	2,075	259	9	C#C,1	171	99	40	1,032	474	99	80 5	٥	20 00	SSC	393	9	8 8	719	16	09	44	33	99
LABOR HOURS SAVING PER YR				3				3	3			9			-	3		3			3		3					6	٣	ס	9				3		1	2			C.	n 60			3			e
MBtu LPG SAVING S																																																
MBtu F. OIL #2 SAVING PER YR										and the second s										:																												
MBtu District Htg SAVING PER YR	8 60	25.70	330	8	12.80	15.40	3.90			7.70	2.00	c	15.40	3 90	15.40		7.70		2.00	12.80		3.30		5.10	1.30	230	29		7¢L	39		6	36	7		2	-	u	0 *	4 -	-		14	4		10	O	
KWM SAVING PER YR		83 884 90	00.50		83,884.90	56,826.30				56,826.30			56 826 30	20,020,00	56.826.30		56,826.30			56,826.30				29,644.00		19,364		7000	16,001				16,001	8,103				6 950	0,000	nca'9			12.001	î				
KW SAVING PER YR										-																																						
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SYSTEM	25.5	2 5	174	¥	HV4	MAU1	MAU1	MAU1	MAU2	MAU2	MAU2	MAU3	MALIS	MALIA	MAU4	MAU4	MAUS	MAUS	MAUS	MAU6	MAU6	MAU6	MAU7	MAU7	MAU7	AHU-1	AHU-1	AHU-1	AHU-2	AHU-2	AHU-3	AHU-3	AHU-3	AHU-4	AHU-4	AHU-4	AHU-5	AHU-5	AHU-5	AHU-6	AHII-7	AHU-7	AHI 1-7	AHU-7	HE-1	뜌-1	HE-2	HE-2
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BLDG DESCRIPTION	COLO TIMOM LITTO	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	DOL WAREHOUSE	DOI, WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOI WARFHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOI WAREHOLISE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE
BLDG NO.		4480	4400	4486	4486	4486	4486	4486	4486	4486	4486	4486	4486	4400	4486	4486	4486	4486	4486	4486	4486	4486	4486	4486	4486	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525	4525

SIMPLE	26.2	NA	N/A	20.9	5.6	N/A	0.5	9.4	2.1	NA	15.0	N/A	3.7	N/A	0.2	1.2	AN C	8.6	V/N	Z A	NA	0.0	N/A	1.1	N/A	0	4.4	ξ σ 2	0.1	2.5	NA	0.1	0.0	O'O	Ψ.X	0.5	0.0	0.0	0.7	NA	XX.	N/A	A/A	117.6	N/A	4114
<u>~</u>	03	¥ N	N/A	0.4	1.6	A/A	18.6	6.0	4.1	V C	5.21	Z Z	2.4	N/A	35.5	7.4	Ψ,	4.0	VIN VIN	Q A	¥ Z	229.7	ΑX	8.3	ΑN	96.2	2.0	¥ 2	148.1	3.5	ΑN	106.6	19.0	0.2C2	¥ N	19.0	252.6	182.1	13.4	¥.	Y.	ΑN.	N/A	0.1	¥.	4/14
SAVING	260	512	512	326	571	512	11,209	342	2,471	512	7,182	512	1,274	512	20,742	4,338	512	23/	212	512	512	66.373	2,626	6,442	512	72,764	719	3516	111,966	1,274	512	80,554	6,908	132,340	512	6,908	152,546	109,962	4,853	512	512	512	1340	72	512	07.0
BLDG. INST.	773)		773	363		604	363	904	i	284	+55	534		584	584	i	534				289		773		756	363	363	756	363		756	363	50		363	604	604	363				604	363		
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COST SAVING PER YR	30	8 8	99	37	92	09	1,313	33	286	8	828	8 09	145	9	2,367	497	<u>ا</u> ه	77	3 8	8 8	8 8	7,668	298	731	09	8,545	82	9 8	12 995	145	99	9,429	784	17,569	8 8	784	17,569	12,673	551	9	09	9	60	2		
HOURS SAVING		3	6			ε				က		6		3			3	C	ν .	0 6	0 6				3		•	3			3			,	3					3	3	3	3		3	,
LPG LPG SAVING PER YR																																											1		-	_
F. OIL #2 SAVING PER YR																																														
MBtul District Htg SAVING PER YR	7			8	15		58	6	35		110.50	08.7	32.80		459.50	85.30		6.10				04 7 4D	67.60	165.80		259.00	18.50	00	1 268 00	32.80		459.50	177.80	2,491.80		177.80	2,491.80	1,749.60	124.90				0	0.70	,	
KWh I							19,364		2,431		5,906.20				5,906.20	2,095.90						63 811 00	20.10.00			135,333.80			135 333 80			135,333.80		120,296.70			120,296.70	90,622.60					00000	7,080,90		
KW SAVING PER YR											2.60					0.90																														_
EMCS FUNC.	_	4	4	7	3	4	-	3	-	4	- 0	S 4	3	4	1	-	4	ε,	4 ,	4 4	4 4	t F			4	-			0 +		_				4 4			-	3	4		4		- "		
SYSTEM EMCS NUMBER FUNC.	a	σ	0	6	-	1	1	-	-	-	4	4	4	4	4	4	4	4	= :	= ;	= 0	n o	0	6	2	2	2	2	7 0	2 2	2	2						-	-	1	Ţ	_			-	•
SYSTEM NAME	2	H H	H-4	H-4	MAU-1	MAU-1	MAU-1	MAU-2	MAU-2	MAU-2	AC-1	A0-1	AC-2	AC-2	AC-2	AC-3	AC-3	AC-3	ACC-1	ACC-2	3 - E	17071	HTP-1	HTP-1	H-4-1	HV-1	HV-1	HV-2	HV-7	£ 2	¥-3	HV-3	MAU-1	MAU-1	MAIL-2	MAU-2	MAU-2	MAU-3	MAU-3	MAU-3	MAU-4	MAU-5	MAU-6	MAU-/	MALI-7	INC.
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BLDG DESCRIPTION		DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	DOL WAREHOUSE	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BLIT DING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	SMA BUILDING	DOLCTONG DOLCTONG
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NO.		4525	4525	4525	4525	4525	4525	4525	4525	4525	4530	4530	4530	4530	4530	4530	4530	4530	4530	4530	4530	4530	4530	4530	4530	4530	4530	54	£ 4	3 2	45	₹	45	4	4	4 £	₹ ₹	<u>ا</u> ۾	4 3	45	45	4	4	4	4	4

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SAVING S		312			2,198	512	206	124	\perp	_	512		512	925		35,814	1	<u> </u>	Ш			13,223		<u> </u>	326		69¢'/	517			1,474	512	512	27	482	212	3,756	233	512	2,400	152	1 841	5
BLDG. INST.		252	1 00	604	604		534	534	604		604	534		534	604	604	363	604	363		300	363	604		534		534	534		604	604	*		534	604	534	604	534		604	434	709	5
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HOURS SAVING PER YR		2	~)		3				e c	3		3			,	2			3	8			3		3		-	3			9	3			5			3		2		
LPG SAVING PER YR																-		-														-											
F. OIL #2 SAVING PER YR										-																																	_
District Htg SAVING PER YR		0	09.00	40.40	36.40		5.30	3.20	22.30		164 00	23.80		23.80	164.00	778.70	113 30	493 50	72.00			311.40	58.30	2000	8.40		87.90	12.60	3	92.40	17.20	2.40		0.70	4.80	7 40	51.00	6.00		41.60	000	3.90	27.20
KWh D SAVING PER YR				4,582.20	1,615.90				1,222.10		1 230 70	0.700.1			1,230.70	12,000.60		4 566 70				2,430.90	8 120 BO	20:07:			8,141.70			6,884.40	1,662.50				613.20		3 651 80			1,615.90			1615.90
KW SAVING PER YR		1			09.0				0.50		0 50	5			0.50								3.10	9			3.10			2.60	0.60				0.20		1 40	2		9.0			2
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SYSTEM NAME		MAU-9	AHO-1	AHU-1	AHU-10	AHU-10	AHU-10	AHU-11	AHU-11	AHU-11	AHU-12	AHI 1-12	AHU-13	AHU-13	AHU-13	AHU-14	AHU-14	AHI-14	AHU-15	AHU-15	AHU-16	AHU-16	AHU-16	AHI 1-2	AHU-2	AHU-3	AHU-3	AHU-3	AHI 1-4	AHU-4	AHU-5	AHU-5	AHU-6	AHU-6	AHU-6	AHU-7	AHO-/	AHU-8	AHU-8	AHU-8	AHO-9	AHU-9	OT IT
BLDG DESCRIPTION		SMA BUILDING	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTR! B! DG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLUG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CN IRL BLUG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLOG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNIRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNIRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	SCIE ICTIONOMO VICE
BLDG No.		4530	10000	10000	10000	1000	1000	10000	10000	10000	10000	10000	1000	1000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	1000	10000	10000	10000	10000	1000	10000	10000	10000	00007

	SIMPLE	60.0	S N	009	10.0	0.5	0.1	NA	17.2	N N	21.4	N/A	NA	2.9	2.9	N/A	2.9	Y Y	7.4	K X	7 7	0.1	8.6	N/A	ΑΝ	1.2	0.2	4.2	1.0	A7 A	4.74	0 1	0.8	Ϋ́	0.3	3.8	Y.	Z C	3.4	N/A	4.3	0.4	N/A	0.2	2.2	2.2	2.7	0.2
	S. S.	10	A N	0.1	6.0	18.4	107.7	N/A	0.5	N/A	0.4	N/A	N/A	3.0	3.0	ΝΑ	3.0	₹ c	3.5	4/2	2 4	79.5	10	N/A	N/A	7.3	42.3	2.1	8.4	2 0	7.0	618	11.3	ΑN	27.1	2.3	K S	X C	2.6	AN N	2.0	22.5	ΑΝ	44.2	4.1	A 1	1 0 1 1	44.2
. O AL	DISC. SAVING	8	133	82	512	8 691	62,050	512	396	512	319	512	512	1,287	1,287	512	1,287	512	7,25,1	212	1 522	60,124	373	512	512	2,657	31,984	983	4,837	710	1 2	37.300	4,095	512	22,808	2,339	210	71.0	2,630	512	2,048	18,967	512	37,300	4,095	4 095	27,300	37,300
BLDG.	INST.	578		578	602	472	576		773		773			433	433		433	9	453		433	756	363			363	756	472	576	773	2	604	363		843	1,007		0.40	1 007		1,007	843		843	1,007	1 007	20,0	043
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100 1800		2		2		-	-	_			_			_	-	-	-	-	-			-	-			-	-		-			1	-		2	5	-	۰	3		3	2		2	6	m		7
- 10 mg/	R POINT	10	16	9	09	286	,054	09	45	90	36	09	99	152	152	09 ;	152	09 0	20 6	3 8	180	7,029	42	09	90	302	3,741	112	559	3 4	2 6	4.300	465	09	2,634	262	2 8	2 848	299	99	232	2,188	09	4,300	465	465	4 300	3
100	SAVING PER YR	1			_		7,0			١		-										7,0				.,	3,7	Ì			-				2,6				7			2,		4,			4	ť,
	SAVING PER YR				8			€.		3		е (6			ا ا	ľ	8	"	0 6				3	3					,	· ·			3		,	2 6			9			3		,			
PG-	SAVING PER YR																																															
F. OIL #2	SAVING PER YR																																															
District Htg	SAVING PER YR					223.70	1,533.10		10.20		8.20											390.10	9.60			68.40	196.90	25.30	66.20	3.70		584.00	105.40		333.70	07.70		375 40	67.70		52.70	292.00		584.00	105.40	105.40	584 00	32.50
7	SAVING PER YR		287.00				5,365.40							2,777.30	2,777.30	0 111	2,777.30	3 285 20	0,200.20		3.285.20	97,058.70					52,521.50		4,888.10			31,535.60		3	21,244.30			21 244 30	20:11:2			16,450.90	1	31,535.00			31 535 60	30,550,10
≩	SAVING PER YR	1.4		1.4																																												1
		-	9	-	4	3	-	4	7	4	7	4	4	-		4 .		4 -	- 4				က	4	4	3				7		-	3	4 ,	- 0	2 <	1	-	3	4	က	-	4	- (20 4	9	-	-
	SYSTEM EMCS NUMBER FUNC.	80	8	80	80	12	12	12	6	6	6	6	14	14	14	14	14	4 2	14	4	14	2	2	2	2	2	2	12	12 2	5 0	0		-						7	7	7	7	7]	\			
	SYSTEM NAME	품	CH-2	CH-2	CH-2	FTR	FTR	FTR	빞	HE-1	HE-2	HE-2	SF-1	SF-1	7-10	2-12	2 0	7 2	7. F.	SF-4	SF-4	AHU-1	AHU-1	AHU-1	AHU-2	AHU-2	AHU-2	FTR-1	FIR-1		H	AH1	AH1	AH1	AH10	2110	AH11	AH11	AH11	AH12	AH12	AH12	AH2	AHZ	AH2	AH3	AH3	2
		6	(h	'n	3	3	9	(2)	C	0		()	0	(2) (7)	2) (2)	2	י) ני) ('		(2)											-				1					-			1				+
	PT ON O	TRL BLD	TRL BLD	TRL BLD	TRL BLD	TRL BLD(TRL BLD	TRL BLD	TRL BLD	TRL BLDG	ITRL BLD	ITRL BLD	TRL BLD	TRL BLD		7 E		7 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		TRI BID	CMD/CNTRL BLDG	HAPEL	HAPEL	HAPEL	HAPEL	4APEL	APEL.	HAPEL	APEL	APE.	APEL	CENTER	CENTER	CENTER	CENTER	CENTER	CENTED	CENTER	CENTER	CENTER	CENTER	CENTER	CENTER	CENTER	CENTER	CENTER	CENTER	֡֝֝֝֝֝֝֝֝֝֝֝֝֓֓֓֝֝֝ <u>֚֚֚֚֚֚֚</u>
	BLDG DESCRIPTION	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNTRL BLDG	DIV CMD/CNIRL BLDG	DIV CMD/CNIRL BLDG	DIV CMD/CNIRL BLDG	DIV CMD/CNIRL BLDG	DIV CMD/CNTRI BIDG	DIV CMD/CNTRI BIDG	DIV CMD/CN	UNIT CHAPEL	UNIT CHAPEL	UNIT CHAPEI	UNIT CHAPE	UNIT CHAPEL	UNIT CHAPEL	UNIT CHAPE	UNIT CHAPEL	UNIT CHAPEL	UNIT CHAPEL	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	DUVE EIT CENTED	DUYN BIT CENTED	PHYS EIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FII CENTER	PHYS FIT CENTER	PHYS FIT CENTER	
	BLDG NO.	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	1000	1000	10000	10030	10030	10030	10030	10030	10030	10030	10030	10030	10030	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	2555

SIMPLE	2.0	0.2	0.4	N/A	7.6	7.6	0.4	N/A	1.0	19.0	N/A	4.0	N/A	Z Z	60	10.8	41.7	0.4	N/A	3.6	0.0	N/A	22.2	0.2	NA	ΑN	0.5	7.2	NA	3/.4	0,	92.3	ΑN	2.6	N/A	0.2	6.5	6.5	AN C	0.5	2. 2	1.5	34.3	NA	34.3	NAN	1.5
R.	4.1	44.2	20.4	N/A	1.2	1.2	20.4	N/A	8.8	0.5	V V	17	N/A	₹ N	9.2	0.8	0.2	20.4	¥.	2.4	584.0	ΑX	0.4	41.4	¥N N	Υ Σ	16.0	1.2	A C	7 2	85	0	ΑX	3.4	N/A	37.5	1.4	1.4	Ψ,	17.0	N/A	5.7	03	S X	0.3	ΑN	13.6
TOTAL \$ DISC. SAVING	4 095	37,300	17,218	512	1,169	1,169	17,218	512	7,454	466	512	1756	512	517	7.745	820	163	5,890	512	1,873	168,778	512	307	11,974	512	512	9,673	443	512	3312	2,469	74	512	1,589	512	21,586	493	493	512	10,283	512	3,428	93	512	93	512	3,428
TOTAL BLDG. INST. COST :	1 007	843	843		1,007	1,007	843		843	1,007	240	1 007	2		843	1,007	773	289		773	289		773	289			904	363	5	505	289	773		472		976	383	363	18	504	3	604	363	,	363		289
A POINT	2	2	2		2	2	2	1	2	2	,	7 0	1		2	2	2			2			2			+	-	+	7	-		2	i	۳		2	+	-	1			+	-		F		-
		2	2				7		2	1	,	7			2			-			-			F		1	=			-	-					-		T	,	- -	†	-				П	
A A O	3				8	3		+	1	3		6				3	-			-			-			1	-	+	+	-		-		-			-		•	- -		-	-		-		-
DO AO DI POINT POINT POINT		2	2				2	,	7		C	7			2			-			-		-	-	Ť	1	-		T	-	-					-		-	7	-	-	-					
S COST SAVING	465	4,300	2,003	8	133	133	2,003	8 8	898	2 2	2000	199	09	99	894	83	19	684	09	213	19,200	8	32	1,414	09	09	1,116	25	2 5	386	291	80	9	180	99	2,455	36	2 2	7 100	1 185	9	399	=	09	#	09	399
LABOR HOURS SAVING PER YR				8			(3		r	2		6	e					3			က		,	e (6		C	2				3		3			C	2		6			3		3	
MBtu LPG SAVING PER YR																																															
MBtu F. OIL #2 SAVING PER YR									-													The state of the s																									
MBtu District Htg SAVING PER YR	105.40	584.00	166.80		30.10	30.10	166.80	0,00	90.70	12.00	250 30	45.20			116.80	21.10	4.20	66.70		48.20	4,104.40		7.90			447.00	147.50	- II	2 20	28.10		1.90		40.90		527.00	12.70	12.70	163 30	163.30		31.10	2.40		2.40		31.10
KWIN SAVING PER YR		31,535.60	23,175.20			20 277	73,173.20	40 405 40	10,480.40		16 450 90	5			6,921.90			7,119.70			20,102.80		010	25,844.70		0 504 70	0/100'0			4,791.40	5,328.60			1		2,397.80			8 501 70	8 501 70		4,791.40					8,502.00
KW EMCS SAVING FUNC. PER YR	3	1	-	4	6	F) 1		4	- 0	0 4	r -	3	4	4	1	3	7	-	4	7	-	4	7		4	7 7	- 0	2	1 (*)) +-	1	7	4	3	4	- 0	2 (0 5	+	-	4	-	3	4	3	4	
SYSTEM EMCS NUMBER FUNC.	7	7	- 1	-	7	7	, ,	, 1	1	7		7	7	7	7	7	တ	6	6	6	6	6	6	ס כ	D *		-		-		6	6	6	12	12	12	- -		- -		-	-	1	-	-	-	- 6
SYSTEM :	AH4	AH4	AHS	AH2	AHS	AH2	QL V	AH6	717) LT V	AHB	AH8	AH8	АНЭ	АНЭ	АНЭ	五	포 모	刑	HE2	F2	HE2		1 E	2012	A LI	200	AHIO	AHI 17	AHU2	HE1	HE1	핖	HE2-PER	HE2-PER	HE2-PER	200	2 2	AHIM	AHU1	AHU1	AHU2	AHU2	AHU2	AHU2	AHUZ	HE1
BLDG	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIL CENIER	PHYS FIL CENTER	PHYS FIL CENTER	THIS FIT CENTER	DHYS EIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIT CENTER	PHYS FIL CENIER	PHIS FII CENIER	BRIGADE HO BLDG	טען ש טרן שעאטואם	BRIGADE HO BLDG	BRIGADE HO BI DG	BRIGADE HQ BLDG	BRIGADE HQ BLDG	BRIGADE HQ BLDG	BRIGADE HQ BLDG	BRIGADE HQ BLDG	BRIGADE HQ BLDG	BRIGADE HQ BLDG	DIVING PLUG		BN HO BI DG	BN HO BLDG	BN HO BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG
BLDG NO.	10050	10050	10050	10050	10050	10050	10030	00001	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	10050	02001	10000	10100	10100	10100	10100	10100	10100	10100	10100	10100	10100	10100	2010	10110	10110	10110	10110	10110	10110	10110	10110	10110	10110

TABLE E-2 SYSTEM SUMMARY LISTED BY BUILDING	
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				ΚW	KWh	MBtu District Htg	F. OIL #2	MBtu LPG	LABOR	\$ COST				TOTAL BLDG.	. TOTAL		
BLDG BLDG NO DESCRIPTION	SYSTEM		SYSTEM EMCS NUMBER FUNG.	SAVING PER YR	SAVING PER YR	SAVING PER YR	SAVING PER YR	SAVING PER YR		SAVING PER YR	DO POINT	AO DI POINT POINT	AT POSET		DISC.	<u>0</u>	SIMPLE
							í		í	.		<u>.</u>					TATBACK.
10110 BN HQ BLDG	H.		9 7			1.90				8		1		2 773	3 74	0.1	92.3
10110 BN HQ BLDG	Ή		9		5,328.60					291	1		-	289	9 2,469		1.0
	Ή		9						3	09					512	A/N	N/A
10110 BN HQ BLDG	Ή	_	9 7			1.90				8		1		2 773	3 74		92.3
10110 BN HQ BLDG	H.		9						3	99					512	N/A	Ž
	HE2-PER					45.20				199		1		1 472	-		2.4
10110 BN HQ BLDG	HE2-PER		12 3			45.20				199		1		1 472	1,756		2.4
10110 BN HQ BLDG	HE2-PER		12 4						3	09					512		N/A
10110 BN HQ BLDG	HE2-PER		12 1		2,397.60	583.30				2,704	-		-	2 576	23,	_	0.2
10110 BN HQ BLDG	HE2-PER		12 4						3	99					_		N/A
10110 BN HQ BLDG	HE2-PER		12 1		2,397.80	583.30				2,704	-		-	2 576	33	1	0.2
10112 ENL BK W/O DIN + ADM & SUPPL	AHU-1		1 3			12.20				54		-		1 363	Ļ.,		6.7
10112 ENL BK W/O DIN + ADM & SUPPL	AHU-1		-		1,683.30	101.60				540	-	1	-	1 604	4 4,727		1.1
10112 ENL BK W/O DIN + ADM & SUPPL	AHU-1		1 4						3	09				İ			Ž
10112 ENL BK W/O DIN + ADM & SUPPL	AHU-2		1]					က	90					512		N/A
	AHU-2		-		1,683.30	101.60				540	-	-	-	1 604	4 4,727	7.8	1.1
	AHU-2					12.20				54		-		1 363			2'9
	AHU-4		1	\int					3	9					512	N/A	N/A
$\overline{}$	AHU-4		1 3			12.20				54		-		1 363	3 474	13	6.7
	AHU-4		-		1,683.30	101.60				240	-	-	-	1 604	4		1.1
	AHU-5	+	1						က	9					_		N/A
	AHU-5	+				87.80			-	387		-			\perp		9.0
	AHU-6	+	1 3			87.80				387		-		1 363	3		0.9
	AHO-6		4 6						3	90							N/A
	Į.		D 0			7.90			-	13		-	+	2 773			60.4
10112 ENL BK W/O DIN + ADM & SUPPL.			D C		707 50			-	7)	9 4]			100			WN.
10112 ENL BK W/O DIN + ADIM & SUFFIC	<u> </u>				00.102				~	2 6		İ	-	697 -	133	0.0	18.4
_	H-7					4 90			,	3 2		-	1	2 773		L	מצפ
	AHU-1	-	4						3	1 89		-				_	A/N
10114 ENL BK W/O DIN + ADM & SUPPL	AHU-1		1			11.70				52		-		1 363	L	L	7.0
10114 ENL BK W/O DIN + ADM & SUPPL	AHU-1		1		1,683.30	97.30				521	-	-	-	1 604	4		1.2
10114 ENL BK W/O DIN + ADM & SUPPL	AHU-2		1 4						3	09					512		N/A
	-		-		1,683.30	97.30				521	-	1	-	1 604	4		1.2
	AHD-2		1			11.70				52		-		1 363			7.0
	AHU-4		4		18	100			3	8					4		A/A
	AHO-4	+			1,683.30	97.30				521	-	-	-		4		1.2
10114 ENL BK W/O DIN + ADM & SUPPL	AHO 4		2 6			11.70				70		-		363		\perp	0.7
10114 ENL BK W/O DIN + ADM & SUPPL	ָרָבְּילְ בַּרְבְּילִ בְּרִבְּילִ					0.±. 0.±.			C	1/5		-		365	2	\perp	0.1
	+		- -						0 6	8 6					512	X X	A/N
	-		1 3			84.10				371		-		1 363	6	L	1.0
10114 ENL BK W/O DIN + ADM & SUPPL	用-1		9 7			2.90				13		-			L		60.4
10114 ENL BK W/O DIN + ADM & SUPPL	Ή-		9		287.50					16	1		-				18.4
10114 ENL BK W/O DIN + ADM & SUPPL	Ή-	_	9						3	09					512		N/K
ENL BK W/O DIN + ADM &	\dashv		9 7			4.90				22		-		2 773	3 190	0.2	35.8
ENL BK W	H-2								e (90			+		512		N/A
10120 BIN FIG. BLUG	2 2	+				12 70			2	20 2							A/A
	AHIM) - -		A 501 70	163.30				1 185	-	- -			4		0.0
	AHI 12	+	- 1		2,100,0	2.40				1,183		-	-	1 604	10,283	17.0	0.0
	į		-			2				-		-	-				ž,

	SIMPLE	1.5	NA	1.0	92.3	N/A	0.2	N/A	2.4	6.7	NA	1.1	N/A	6.7	1.1	6.7	11	N/A	0.9	ΚX	ΑN	0.9	N/A	18.4	60.4	NA I	35.8	1.2	N/A	7.0	1.0	N N	7.0	1.2	N/A	1.0	XX	NA	1.0	60.4	18.4	N/A	92.0 A/N	7	- 10	2.5	4 4	31.7	N/A	92.3
	SiR	5.7	Ϋ́	8.5	0.1	ΑX	41.3	N/A	3.7	1.3	Ν	7.8	N/A	1.3	7.8	1.3	7.8	Α Α	9.4	¥N	Ϋ́	9.4	ΑX	0.5	0.1	₹ Ž	0.2	7.5	ξ.	5. 6.	7.5	N/A	1.3	7.5	N/A	9.0	ΑN	¥.	9.0	0.1	0.5	¥ c	7.0 N	1 // /	17.7	214	Z 42	0.3	N/A	0.1
TOTAL \$	DISC. SAVING	3,428	512	2,469	74	512	23,773	512	1,756	474	512	4,727	512	474	4,727	474	4,727	512	3,411	512	512	3,411	512	133	113	512	190	4,560	710	455	4 560	512	455	4,560	512	3,267	512	512	3,267	113	133	512	190	212 575	10 719	10,7 13	3510	1_		74
TOTAL BLDG.	INST. COST	604		289	773		9/9		472	363		604		363	604	363	604		363			363		289	1/3		773	604	000	363	503	8	363	604		363			363	773	289	110	(/3	363	202	5	604	363		773
	POINT	-			2		2		1	-		1		1	1	1	1		-			-			2		2		,			-	-	-		1				2		(7	•	-		-			2
	POINT	-		-			1					٦			-		-							1							-			-													_			
	AO POINT	-			-		_		-	-		1		1	-	-	-		-			-			-		-	-	Ī		-	•	1	1		-			-					-	- -	-	-	-		-
	DO AO POINT POINT	-		÷			1					-			-		-							-				-			7	-		-							-				٢	-	1	-		
cosT	SAVING PER YR	399	8	291	8	9	2,704	9	199	54	09	540	90	54	540	54	540	8	387	8	8	387	99	16	13	8	22	521	200	25	521	9	52	521	9	371	99	99	371	13	16	29 60	77 09	3 8	1 235	CC7'1	60 40a	11	90	8
LABOR HOURS	SAVING PER YR		3			3		8			3		3		*			3		8	3		က			3		,	50			6			8		8	3				3	~	,			3		3	
MBtu LPG	SAVING PER YR																																									1			-		+		_	
MBtu F.OIL#2	SAVING PER YR																																																	
MBtu District Htg	SAVING PER YR	31.10			1.90		583.30		45.20	12.20		101.60		12.20	101.60	12.20	101.60		87.80			87.80			2.90		4.90	97.30		11.70	97.30	8	11.70	97.30		84.10			84.10	2.90		100	4.90	12 67	13.50	174.30	33.20	2.60	i	1.90
	SAVING PER YR	4.791.40		5,328.60			2,397.80					1,683.30			1,683.30		1 683 30							287.50				1,683.30			1 683 30	200-		1,683.30							287.50				0 504 70	8,501./U	4 704 40	4,101.40		
¥	SAVING PER YR																																																	
	EMCS FUNC.	-	4	-	7	4	-	4	3	3	4	-	4	3	,	3	1	4	3	4	4	9	4		_		7				2 -				4	3	4		3	7					χ) τ		4 -			
	SYSTEM EMCS NUMBER FUNC.	-		6	6	6	12	12	12	-	-	-	-	-	-	-	+	-	-		-		6	6	6	6	6	-		- -					-	-	*		1	6	6	6	6 0	7						6
	SYSTEM	AHU7	AHU2	出	里	HE	HE2-PER	HE2-PER	HE2-PER	AHU-1	AHC-1	AHU-1	AHU-2	AHU-2	AHU-2	AHU-4	AHU-4	AHU-4	AHU-5	AHU-5	AHU-6	AHU-6	H-1	H-1	¥	HE-2	HE-2	AHU-1	AHC-1	AHU-1	AHU-2	AHIL?	AHI 14	AHU-4	AHU-4	AHU-5	AHU-5	AHU-6	AHU-6	Ή-		出	HE-2	7-71	AHC:	AHCI	AHC1	AHU2	AHU2	里
										Iddi	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	on logic	SIPPI	SUPPL	SUPPL	SUPPL														
	BLDG DESCRIPTION	PO IN HOR	BN HO BI DG	BN HO BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HO BLDG	ENI BK W/O DIN + ADM & SUPPL	ENE BK W/O DIN + ADM &	ENI BK W/O DIN + ADM & SUPPL	FNL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SI IPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENIL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + AUM & SUPPL	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HO BLDG	BN HO BLDG	BN HQ BLDG
		lc			0	0	0	2 0		\neg								Ⅱ															24 EINL BY												90	8	30	30	3 6	3 8
	BLDG No.	10420	10120	10120	10120	10120	10120	10120	10120	10122	10122	10122	10122	10122	10122	10122	10122	10122	10122	10122	10122	10122	10122	10122	10122	10122	10122	10124	10124	10124	10124	10124	10124	10124	10124	10124	10124	10124	10124	10124	10124	10124	10124	10124	10130	10130	10130	10130	10130	10130

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SIMPLE	PAYBACK	NA	1.0	0.2	2.2	N/A	N/A	1.6	N/A	1.1	1.1	N/A	N/A	1.6	1.6	NA	N/A	1.6	N/A	9.0	1.4	9.0	NA	1.4	9.0	NA.	1.4	0.6	4.1	N/A	N N	Ν	46.1	18.4	1.6	N/A	0.0	YN:	NA	0.9	1.6	N/A	1.6	N/A	O.I.O	5.5	S AN	0.9	N/A	6.0
10. 1 1 170	쮼	Α.Ν.	8.5	44.0	4.0	ΝA	ΑN	5.4	ΑN	8.3	8.3	ΑN	Ϋ́	5.4	5.4	¥	Ϋ́	5.4	ΑΝ	0.	6.2	1.0	Ϋ́	6.2	9	ØN 0	9.7	1.0	7.0	¥ ×	¥ X	ΑX	0.2	0.5	5.4	ΑN	6.6	¥ :	¥ N	6.6	5.4	Y.	5.4	A/A	1 A	1 6	. ¥	9.4	ΑN	9.4
DISC.	SAVING	512	2,469	25,327	1,877	512	512	2,359	512	3,011	3,011	512	512	2,359	2,359	512	512	2,359	512	354	3,729	354	512	3,729	354	512	3,729	354	3,723	284	512	512	148	133	2,359	512	3,582	512	212	3,582	2,359	512	2,359	710	512	587	512	5,671	512	5,671
_11111111111111111111111111111111111111	COST		289	276	472			433		363	363			433	433			433		363	604	363		604	363	26	500	363	904				773	289	433		363			363	433		433	433	2	363		604		604
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COST	PER YR	9	291	2,880	213	90	90	279	99	342	342	9	8	2/9	2/9	90	8	279	8	8	427	8	8	427	8 8	2 5	471	04	7 6	32	8	90	17	16	279	90	404	8 8	3	407	279	9	2/9	00/2	60	67	8	647	9	647
	PER YR	3				6	3		8			0	e		1	e	m	,	m				6		c	2			r		6	3				9	(m c	?			e	r	2	6	,	3		3	
	PER YR																																																	
F. OIL #2 SAVING	PERYR																																																	
District Htg SAVING	PEK YK			623.30	48.30					77.50	77.50									9.10	06'67	9.10		75.90	2.5	75 90	0.30	75.90	000	7.30			3.80				92.20		0000	92.20						15.10		125.90		125.90
KWh SAVING	PEK TK		5,328.60	2,397.80				5,092.00					0000	3,092.00	2,032.00		8	2,092.00		18	1,583.30			1,683.30		1 683 30	3	1 683 00	20000					287.50	5,092.00						5,092.00	0000	2,092.00	5 092 00				1,683.30		1,683.30
SAVING	רבא זא אר																																																	
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SYSTEM EMCS	NOMBER	6	6	12	12	12	4	14				- ;	14	7 2	1 7	4 ,	41	4		-									-	12	6	12	6	σ :	4	14				;	14	4 2	1 2	14	14	-	-			
SYSTEM	NAME	빞	Ή	HE2-PER	HE2-PER	HEZ-PER	AHU-1	AHO-1	AHU-10	AHU-10	AHU-11	AHU-11	AHU-2	7-004	200	AHO-3	AHU-4	AHO-4	AHO-0	AHO-6	AHO-0	AHU-/	AHU-/	AHO-/	AHI L8	AHILB	O THE	AHU-9	AHI L'9	H-H-H	H-1	HE-1	분	보	AHU-1	AHU-1	AHU-10	AH 1-13		AHO-11	AHU-2	AHU-2	2017	AHI1-4	AHU-4	AHU-6	AHU-6	AHU-6	AHU-7	AHU-/
							SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	וקקט:	וממוט	ים וים	SUPPL	SUPPL	SUPPL	JAK I	SOFF	200	SUPPL	OPPL Spirit	SUPPL	SI IPPI	ldd ls	10010	SUPPL	Iddi IS	SUPPL	SULT.	1 2 2	SUPPL SUPPL	SUPPL	SUPPL	Jadi IS	Sippi	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	אלול							
0	2	3LDG	3LDG	arde	3.DG	arne Serie	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK VV/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	\$ \$ \$ \$ \$ \$ \$	EINL BK VV/O DIN + ADM & SUPPL	ENL BK VV/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BR W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	AUM &	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	FNI BK W/O DIN + ADM & SI IPPI	ENI BK W/O DIN + ADM & SI IPPI	EN BK W/O DIN + ADM & SUPPI	ENI BK W/O DIN + ADM & SI IPPI	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SI IPPI		ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENCEDE W/O DIN + ADM & SLIDE	ENL BK W/O DIN + ADM & SLIPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	AUM &
BLDG	ב צייטרים	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HO BLDG	NIO	O CIN	NIOO	NIO O/	NIO O/	NIO O														NO	S C	NO O	NIC C	NO O	NIO O/	VO DIN	NO DIN	NIO O	NO O	NIO					NO O		NICO	NIC O	NIO O/	NIO O/	NIO O/	NO ON	NO O	200
							AL BK W	N RK W	A BK	N BK ∨	F BK ∨	N BK W	A A A			N	X X X	N 20 20 20 20 20 20 20 20 20 20 20 20 20	M BK V	N	N	N N N	N		R R V	E RK	BK W	E BK	E RK V	F BK W	IL BK ₩	N BK №	N BK N	N BK	N BK	A RK	N N N	E DY	יר טול אי אין אין אין אין אין אין אין אין אין אין	A	H BK V	A A A	RK W	BK W	F BK V	AL BK V	⊩ BK V	F BK ∨	N N N N N N N N N N N N N N N N N N N	L SK V
BLDG	ź	10130	10130	10130	10130		10132 EN						10132 En		_									10132 EN							10132 EN			10132 EN			10134			10134 EN		10134 EN					10134 EN		10134 ENL BK W/O DIN + ADM & SUPPL	0134 =
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SIMPLE	5.5	N/A	5.5	0.9	5.5	S N	N/N	N/A	18.4	N/A	46.1	1.3	40	0.4	N N	0.8	6.0	0.4	N/A	0.2	0.5	N/A	V/N	0.5	NAN A	1.2	7.8	Y.V	0.4	A/N	0.0	7.3	NA	N/A	5.1	0.4	5.6	N/A	0.4	0.2	13.5	N/A	13.5	N/A	Y X	0.2
SIR	1.6	ΑN	1.6	4.6	1.6	4.0 4.0	Z A	Ϋ́Z	0.5	N/A	0.2	6.7	24.0	24.4	ΑN	11.4	10.1	24.6	N/A	38.0	16.1	N/A	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	16.0	A'N	7.4	1.1	Y.	23.1	¥ 6	2.0	1 2	Y.N	Ν	1.7	20.2	1.6	N/A	20.2	52.6	0.7	¥N N	0.7	A/N	Y AN	52.6
TOTAL \$ DISC. SAVING	287	512	587	5,6/1	587	512	512	284	133	512	148	2,448	12 707	18,456	512	4,138	3,648	18,584	512	28,758	5,839	512	2,432	12.088	512	4,462	412	1,799	6,670	212	431	571	512	512	1,329	5,846	1,224	512	5,845	39,801	237	512	237	212	512	39 801
TOTAL BLDG. INST. COST 8	363		363	604	363	5			289		773	363	604	756		363	363	756		756	363	262	202	756		604	363	1	588	277	578	472			773	289	773		589	756	363		363	756	3	756
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COST SAVING PER YR	29	90	29	047	647	6	9	32	16	09	17	8/7	1 469	2,127	09	470	414	2,148	90	3,322	663	926	2/0	1.396	89	522	47	204	765	8 8	945	5	8	09	151	069	139	90	069	4,695	27	8	27	5 633	09	4 695
LABOR HOURS SAVING PER YR		3				3	6			3		4			Э				3		•	9	C.		3				C	0			3	3			Ì	က				က	·	2	3	
MBW LPG SAVING PER YR																																														
MBtu F. OIL #2 SAVING PER YR	Torres.						-																								-															
MBTU District Htg SAVING PER YR	15.10		15.10	123.30	125.90			7.30			3.80	03.00	174.40	294.70		106.50	93.90	260.00		416.10	150.30	62.60	00.70	173.40		29.20	10.60	46.30	128.30	44 40	57.70	14.70			34.20		31.50			24.10	6.10	9	6.10	24.10		24.10
kWh SAVING PER YR			1 000 00	1,000,00	1 683 00	200			287.50				12,801,70	15,122.30				18,308.00		27,177.00				11,550.20		7,181.90		0000	3,637.00		12 616 70	2				12,617.00			12,616.70	83,884.90				101.035.00		83.884.90
KW SAVING PER YR																	,																													
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SYSTEM EMCS NUMBER FUNC.	-	-	-	-	-	-	6	12	6	12	6	-	-	2	2	2	2	2	2	2	2 0	2 0	2	2	-	-	-	o 0	5 C	n o	12	12	12	6	6	O	6	6	o (2 2	2	2	7 (2	2	2
SYSTEM	AHU-7	AHU-8	AHU-8	0-0-1-1-4	AHI L-9	AHU-9	出.	HE-1	品.1	H-1	무 :	AHU1	AH01	AHU2	AHU2	AHU2	AHU3	AHU3	AHU3	AH04	AH04	AHU4	AHU5	AHUS	AHU6	AHU6	AHU6	到			HTD	HTP1	HTP1	HTP2	HTP2	HTP2	НТРЗ	HTP3	HTP3	¥ E	≨	¥ !	HAZ	HV2	Ş	HV3
	SUPPL	SUPPL	SUPPL	N SOFFIL	SIPPI	SUPPL	SUPPL	SUPPL	SUPPL.	SUPPL	SUPPL																				_	_		2							,				_	2
BLDG DESCRIPTION	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK VV/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SI IPPI	FNI BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	10134 ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	10134 ENL BK W/O DIN + ADM & SUPPL	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	TINE PERSONN	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP
					10134 ENL B		10134 ENL B	0134 ENL E	10134 ENL B	10134 ENL B	0134 ENL E	10150	10150	10150	10150	10150	10150	10150	10150	10150	10150	10150	10150	10150	10150	10150	10150	10150	10150	10150	10120	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170

SIMPLE	13.5	N/A	26.6	0.2	0.2	22.2	N/A	0.2	45.7	A/A	0.2	N/A	22.2	0.2	22.2	N/A	A/A	0.2	45.7	0.2	ΑΝ	26.6	0.4	68.6	NA	7.2	NA	0.5	1.6	37.4	¥ į	92.3	1.0	AN C	2.6	0.2	¥ C	- N	<u> </u>	- 6	- AN	0.1	NA	1.5	76.2	N/A	5.2	0.5	3.7	12.0
SIR	0.7	N/A	0.3	52.0	44.5	0.4	N/A	44.1	0.5	N/A	44.5	N/A	0.4	44.5	0.4	N/A	ΑN	44.1	0.2	44.4	N/A	0.3	23.0	0.1	N/A	1.2	N/A	16.0	5.5	0.2	¥,	÷ ,	8.5	AN C	4.6	37.5	Y 2	O V	2 0	0.7	N/A	61.1	N/A	5.8	0.1	ΝΆ	1.6	18.1	2.4	0,7
SAVING	237	512	120	39,331	26,888	144	512	26,608	70	512	26,888	512	144	26,888	144	512	512	26,608	2	26,794	512	120	13,921	47	512	443	512	9,670	3,312	82	512	74	2,469	512	1,589	21,586	217	512	7 050	63 477	1 024	35,206	512	2,727	89	512	471	10,563	1,255	455
BLDG. INST.	363		363	156	604	363		604	363		604		363	604	363			604	363	604		363	604	363		363		604	604	363	i	773	289	į	472	9/6	oac	202	4 007	3 2	3	576		472	773		289	584	534	647
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COST SAVING PER YR	27	9	14	4,641	3,172	16	90	3,140	8	09	3,172	90	16	3,172	16	90	60	3,140	8	3,161	90	14	1,643	5	09	20	09	1,116	386	19	09	8	291	9 9	200	2,455	200	60	200	7 464	120	4,002	90	310	10	90	26	1,228	142	54
HOURS SAVING PER YR		င					က			3		က				3	3				က		-		3		က			(20		(ED .		٣	2	ď	,		9	-	3			3				
LPG SAVING																																																		
F. OIL #2 SAVING PER YR				•						-																							***************************************																	
District Htg SAVING PER YR	6.10		3.10	12.00	14.40	3.70		7.20	1.80		14.40		3.70	14.40	3.70			7.20	1.80	12.00		3.10	4.80	1.20		11.40		147.50	28.10	2.20		1:90		5	40.90	00.726			10.50	130.40	2	872.00		70.20	2.30			108.90	32.30	
KWh I SAVING PER YR				83,885.00	56,826.30			56,826.30			56,826.30			56,826.30				56,826.30		56,826.30			29,644.00					8,501.70	4,791.40			00 000	2,328.50		00 200 0	7,387.00	4 865 50	2000	16 102 00	122 406 00	2000	2,865.00					1,016.80	13,071.40		982.70
KW SAVING PER YR																																					15	r		28.1								4.7		
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SYSTEM ENCS NUMBER FUNC.	2	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	1	-	-	-	-	-	-	-	-	(6	S (o (71	2 5	11	=======================================		7	7	12	12	12	6	6	6	4	4	4
SYSTEM	HV3	HV4	HV4	HV4	MAU1	MAU1	MAU1	MAU2	MAU2	MAU2	MAU3	MAU3	MAU3	MAU4	MAU4	MAU4	MAUS	MAUS	MAUS	MAU6	MAUG	MAU6	MAU7	MAU7	MAU7	AHU1	AHU1	AHU1	AHU2	AHU2	AHUZ	Ŧ	֡֞֞֜֞֜֞֜֜֞֓֓֓֓֓֓֓֓֟֟֜֓֓֓֓֓֓֓֓֓֓֓֟֟֝֓֓֓֓֓֓֓֟	HEI	בן לבן היים ביים ביים ביים ביים ביים ביים ביים	HEZ-PER	1000 1000	ACC 4	2 2	AHIM	AHU!	X	HX1	HX1	HX2	HX2	HX2	AHU1	AH01	AH01
BLDG DESCRIPTION	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	BRIGADE HQ BLDG	BRIGADE HQ BLDG	BRIGADE HO BLDG	BRIGADE HO BLDG	BRIGADE HQ BLDG	BRIGADE HQ BLDG	BRIGADE HQ BLDG	BRIGADE HO BLDG	BRIGADE HO BLDG	BRIGADE HO BLDG	BRIGADE HU BLDG	DENTAL OF INIO	DENTAL CLINIC	CENTAL CLINIC	DENTAL CLINIC	DENTAL CLINIC	DENTAL CLINIC	DENTAL CLINIC	DENTAL CLINIC	DENTAL CLINIC	DENTAL CLINIC	DENTAL CLINIC	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB
	VE	VE	VE	3	VE	VE	Ŋ	Ψ.	Ϋ́	¥	¥.	3	K	KE	¥	Ϋ́	Ϋ́	Ä	 	×	\ <u>\</u>	3	3	VE	VE	H.	BR	H.	BR	HA I	쑮	HH I	꽃 !	R 3	¥ 8	H G					_			ا ل		י		ω	í Ú	
BLDG NO.	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10170	10200	10200	10200	10200	10200	10200	10200	10200	10200	10200	10200	10205	40205	2020	10203	10205	10205	10205	10205	10205	10205	10205	10201	10207	10207

SIMPLE		N/A	0.5	Z C	7.7	A/N	A/N	0 5	A O	0.2	2.4	N/A	0.0	10.01	2.2	A/N	XX	2.2	10.0	NA	10.0	2.2	10.0	N/A	6.0	6.5	N/A	0.5	34.3	X N	1.5	1.0	N/A	92.3	1.7	N/A	Ϋ́Ν	1.6	1.0	NA	N/A	10	NA	1.6	1.6	Y Y	Y X	1.1	6.3
SIR PA S	- 11	Y.V	16.2	¥,	4 4/14	NA S	A/A	0.0	N/A	38.5	3.6	N/A	30.7 N/A	6.0	3.8	NA	¥ N	3.8	0.0	ΑN	6.0	3.8	6.0	¥N N	9.6	1.4	A/N	17.0	0.3	¥ N	2.2	8.5	A/A	0.1	1.0	Z X	ΑX	5.4	9.6	N/A	ΑN	8.6	N/A	5.4	5.4	A/A	† 4 Z	8.3	1.4
SAVING		512	9,769	078	2,100	212	210	3,015	111	23,232	1,927	87/	542	512	2.197	310	310	2.197	512	310	512	2,197	512	324	5,642	493	512	10,283	66	512	3,428	2,469	512	4 750	23.760	512	512	2,359	3,104	512	512	3,104	512	2,359	2,359	212	512	5,023	209
TOTAL TOTAL BLDG. INST. COST IS	: 41		604	25	234		1	534		904	534	700	400	602	578			578	602		602	578	602		578	363		604	363		604	289	1	1/3	576	2		433	363			363		433	433	433	3	604	363
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MBCU LPG SAVING PER YR																						_																					_			_	1	+	
MISTUL F. OIL #2 SAVING PER YR	í												- American			7 60	7.60	8		7 60																													
MBtu District Htg SAVING PER YR			196.70		56.10			77.60		210.00	49.60	9	168.40													12.70		163.30	2.40		31.10			1.90	45.20	283.20			79.90			79.90						109 20	13 10
KWIN D			3,223.10	1,768.90					2,397.80	31,166.00		1,572.30	24,553.90		4 741 30			4 741 30	00.11			4 741 30	2	698 60	10 809 90	20,000,01		8.501.70			4,791.40	5,328.60			1000	7,387.80		5,092.00						5,092.00	5,092.00	00 000 2	5,092.00	1 683 30	1,000.00
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		EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLOB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB	EXCHANGE/CLUB		BN HG BLDG	BN HO BI DG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG				BIN HO BLUG	ENL BY W/O DIN + ADM & SLIPPI	CALL BY W/O CHIN & SI IPPI	ENE BY W/O DIN + ADM & SUPPL	EN BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	10212 ENL BK W/O DIN + ADM & SUPPL
og 1	9	10207	10207	10207	10207	10207	10207	10207	10207	10207	10207	10207	10207	10207	10207	10201	10207	10207	10207	10207	10207	10207	10207	10207	10207	10207	01701	10210	10210	102.10	10210	10210	10210	10210	10210	10210		10212 EN		10212 EN			10212 EN			10212 EN	10212 EN	10212 EN	10212 EN

	SIMPLE	N/A	6.3	1.1	N/A	1.1	N/A	6.3	1.1	6.3	NA	Ϋ́Z	A/N	46.1	A N	18.4	NA	6.7	1.1	6.7	1.1	N/A	N/A	1.1	6.7	0.9	NA	0.9	A'N	18.4	60.4	Z/Z	8.08	2 0	0,00	S X	N/A	34.3	1.5	1.0	92.3	NA	NA	2.4	0.2	1.6	N/A	1.0	N/A	1.0
	SiR	4X	14	8.3	N/A	8.3	N/A	1.4	8.3	1.4	¥ X	¥ N	A/N	0.2	Ø.N	0.5	ΑN	1.3	7.8	1.3	7.8	¥	N/A	7.8	1.3	9.4	ΝA	9.4	¥ N	0.5	0	K C	202	17.0	7 7	Y X	ΑX	0.3	5.7	8.5	0.1	¥ Z	¥ Z	3.7	41.3	5.4	ΔN S	9.6	Ψ.O	8.6
TOTAL \$	DISC. SAVING	512	209	5,023	512	5,023	512	509	5,022	509	512	512	512	148	284	133	512	474	4,712	474	4,712	512	512	4,712	474	3,400	512	3,400	512	133	113	716	190	10 283	493	512	512	93	3,428	2,469	74	512	512	1,756	23,769	2,359	512	3,104	512	3,104
	INST.		363	604		604		363	604	363				773		289		363	604	363	604			604	363	363		363		289	773	44	(//3	604	363	3		363	604	289	773		92.5	472	576	433	000	363	200	363
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cost	SAVING PER YR	99	28	574	09	574	09	58	574	28	09	99	99	17	32	16	99	54	538	54	538	9	09	538	54	386	90	386	99	16	13	8 8	77 09	1 185	5.6	8 8	99	1	399	291	89	8	8 5	199	2,703	279	8 2	352	D S	352
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	SAVING PER YR																																																	
MBtu F. OIL #2	SAVING PER YR																																																	
MBtu District Htg	SAVING PER YR		13.10	109.20		109.20		13.10	109.20	13.10				3.80	7.30			12.20	101.20	12.20	101.20			101.20	12.20	87.50		87.50		0	2.90	5	9.9C	163.30	12.70	2		2.40	31.10		1.90		100	45.20	583.20		20 05	08.87	20.07	/9.90
7 147	SAVING PER YR			1,683.30		1,683.30			1,683.00							287.50			1,683.30		1,683.30			1,683.30						287.50				8 501 70	2				4,791.40	5,328.60					2,397.80	5,092.00				
ΚM	SAVING PER YR																																																	
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	SYSTEM	AHU-6	AHU-7	AHU-7	AHU-7	AHU-8	AHU-8	AHU-8	AHU-9	AHU-9	AHU-9	- 出	H	岩	出.	弄	AHU-1	AHU-1	AHU-1	AHU-2	AHU-2	AHU-2	AHU-4	AHU-4	AHU-4	AHU-5	AHU-5	AHU-6	AHU-6	발!	H-1		HE-2	AHI 11	AH 1	AHU1	AHU2	AHU2	AHU2	HE1	Ή	포	HE2-PER	HE2-PER	HE2-PER	AHU-1	AHU-1	AHU-10	AHU-10	AHU-11
	BLDG	BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	10214 ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	BY HO BI DO	BIN HO BLDG	BN HO BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HO BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL
	BLDG NO.	10212 FNL				10212 ENL	10212 ENL	10212 ENL										10214 ENL	10214 ENL	10214 ENL	10214 ENL		10214 ENL	10214 ENL		10214 ENL	10214 ENL	10214 ENL	10214 ENL	4 EN	10214 ENL	10214 ENL	10214 ENL		10220	10220	10220	10220	10220	10220	10220	10220	10220	10220				10222 ENI		10222 ENI

LE E-2 LISTED 6	TABLE E	TA JMMAR
LE E-2 LISTED	TABLE	TA JMMAR

SIMPLE	PAYBACK	VIV	2 4	NA	1.6	1.6	NA	6.3	NA	1	NA	1.	6.3	6.3	N/A	-	6.3	Y,	- 0	4.0	N/A	46.1	N/A	¥.	1	6.7	N/A	=	6.7	67	X X	NA	6.0	N/A	6.0	18.4	4 N	Y A	35.8	0.5	NA	6.5	34.3	N/A	1.5	A'A	1.0	6
1000	Sis.	ΝV	5.4	N/A	5.4	5.4	N/A	1.4	N/A	8.3	N/A	8.3	4.	4.	NA NA	8.3	4.7	Υ C α	0 0	2 5	Z Z	0.2	N/A	N/A	7.8	1.3	NA	7.8	7.3	3 6	N/A	N/A	9.4	¥ ;	4 1	0.0	AN	N/A	0.2	17.0	N/A	1.4	0.3	N/A	5.7	N/A	8.5	-
DISC.	SAVING	512	2,359	512	2,359	2,359	512	509	512	5,023	512	5,023	209	203	512	5,023	542	5 000	133	512	512	148	284	512	4,712	474	512	4,712	4/4	474	512	512		3.400	L		L						4		3,428			74
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LPG SAVING PER YR																		1			1											-				+	-				-				+	+	_	
F. OIL #2 SAVING PER YR																								-						-															+	+		
SAVING PER YR							13.10		109.20		109.20	13.10	13.10	100 00	109.20	13.10	100 20	07:00			3.80	7.30		101.20	12.20		101.20	12.20	12.20	24.4		87.50		87.50	00.0	2.30		4.90	163.30		12.70	2.40		31.10		1 00	1.90	
SAVING PER YR		5,092.00		5,092.00	5,092.00				1,683.30		1,683.30			1 683 30	1,000,50		1.683.00	287.50						1,683.30			1,683.30	1 683 30	000,000					287.50		-			8,501.70	-	+	+	1	4,791.40	5.328 60	20.02	-	
SAVING PER YR						+	1					+	+			-	-								+			-				1	-						89		1	+	+	4,7	5.3	-		
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SYSTEM NAME 1	AHU-2	AHU-2	AHU-3	AHI 1-4	AHI 1-4	AHILA	AHILE	2 2	AHIL7	AHI17	AHI 1.7	AHU-8	AHU-8	AHU-8	AHU-9	AHU-9	AHU-9	上十	里	平 平	· 上	- 出	AHI 4		AHU-2	AHU-2	AHU-2	AHU-4	AHU-4	AHU-4	AHU-5	AHILA	AHU-6	H-1	HE-1	开.	22	HE-2	AHU1	AHIM	AHU	AHU2	AHU	三里	Ή.	开	HE2-PER	
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BLDG DESCRIPTION	/ + NIO C	+ NIO	+ NIC	V + NIO	DIN + A	DIN+	DIN+A	DIN + A	DIN+A	DIN + A	DIN+A	DIN + A	DIN + A	DIN + A	DIN + A	DIN + A	DIN + A	+ VIO	ON + A	4 + A	+ A	+ N	DIN + AL	DIN + A	OIN + AC	JN + AL	OIN + AC	OIN + AC	OIN + AD	+ AU	N + AD	NIN + AD	IN + AD	N+ AD	N+ AD	N + AD	+ AD	BN HO BI DO	BN HO BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HO BLDG	BN HQ BLDG	BN HQ BLDG	
Ō	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SLIPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SLIPPI	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SLIPPI	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPL	BK W/O	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENC BY W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	EN BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SI IPPI	ENL BK W/O DIN + ADM & SI IPPI	ENL BK W/O DIN + ADM & SUPPL	3K W/01	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SLIPPI	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	K W/O	ENE BY W/O DIN + ADM & SUPPL	BNF	BN	BNF	BNF	BN	BNH	BNH	BNH	BNH	BNH	!
,		10222 ENI		10222 ENL	10222 ENL	10222 ENL	10222 ENL	10222 ENL				222 ENL							24 ENL	24 ENL 1	24 ENL		24 ENL E	24 ENL E	24 ENL E					4 ENL B	4 LINE D	10224 ENL BK W/O DIN + ADM & SUPPL	T I		0						_							
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SIMPLE	0.0	N/A	N/A	1.6	1.0	A/A	N/A	1.6	N/A	1.6	N/A	N/A	1.6	N/A	1.1	6.3	1.1	A/A	500	0.3	- NA	63	1.	NA	N/A	N/A	46.1	18.4	N/A	NA	1.6	A S	8.0	6.0	NA	1.6	1.6	N/A	1.6	N/A	N/A	5.6	1.0	5.6	1.0	AN .	0.1
쭚	7.	¥ Ž	A/A	5.4	8.6	Y W	N/A	5.4	Ϋ́	5.4	N/A	N/A	5.4	N/A	8.3	1.4	8.3	VA.	4 4	4.0	2.0	1 4	8.3	N/A	N/A	N/A	0.2	0.5	Y.	ΑN	5.4	₹ C	0.0	9.5	ΑN	5.4	5.4	N/A	5.4	Ϋ́	N/A	1.6	9.1	1.6	9.1	V.	55
TOTAL \$ DISC. SAVING	23.760	512	512	2,359	3,108	3 108	512	2.359	512	2,359	512	512	2,359	512	5,023	203	5,023	212	SOC S	200	542	509	5.022	512	512	512	148	133	284	512	2,359	512	5,434	3.454	512	2,359	2,359	512	2,359	512	512	267	5,497	567	5,497	512	5,497
BLDG. INST.	578	2		433	363	263	3	433		433			433		604	363	604	5	200	203	100	363	604				773	289			433	200	203	363		433	433		433			363	604	363	604	100	604
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HOURS SAVING PER YR		3	3		C	2	.3		3		က	3		3				2			~	3		3	3	3				3		3	۲		3			3		3	3				ſ	3	~
LPG SAVING PER YR																																													1		-
F. OIL #2 SAVING PER YR	-															:												3																			
MBEU District Htg SAVING PER YR	583 20	2			80.00	00.08	3								109.20	13.10	109.20	0	13.10	13.10	109.20	13.10	109.20				3.80		7.30			000	00.30	88.90								14.60	121.40	14.60	121.40	124 45	121.40
SAVING PER YR	2 397 BD	20:100/4		5,092.00				5.092.00		5,092.00			5,092.00		1,683.30		1,683.30			1 693 20	1,003.30		1.683.00					287.50			5,092.00					5,092.00	5,092.00		5,092.00				1,683.30		1,683.30	4 600 00	1,683.30
KW SAVING PER YR	100																																			_											
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SYSTEM EMCS NUMBER FUNC.	12	12	14	14		- 1		14	14	14	14	14	4												6	12	6	6	12	14	14		-		14	14	14	14	14	14				<u>`</u>	-		
SYSTEM	AEO CON	HE2-PER	AHU-1	AHU-1	AHU-10	AHU-10	AHII-11	AHU-2	AHU-2	AHU-3	AHU-3	AHU-4	AHU-4	AHU-6	AHU-6	AHU-6	AHU-7	AHU-/	AHU-	AHC-8	o-DEA	AHIL-9	AHU-9	AHU-9	<u> </u>	吊	표-	Ή-	뽀	AHU-1	AHU-1	AHU-10	AHU-10	AHU-11	AHU-2	AHU-2	AHU-3	AHU-3	AHU-4	AHU-4	AHU-6	AHU-6	AHU-6	AHU-7	AHU-7	AHU-7	AHO-8
			SUPPL	SUPPL	SUPPL	SUPPL	our le	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL SUPPL	SUPPI	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	Suppl	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	, SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL
No. L	2	100 E	ADM &	ADM &	ADM &	ADM &	8 8 E	ADM &	ADM &	- ADM &	- ADM &	· ADM &	- ADM &	- ADM &	- ADM &	ADM &	- ADM &	- ADM &	- AUM &	ADM	AUM	A MCA	ADM &	ADM &	- ADM &	- ADM &	- ADM &	+ ADM &	+ ADM &	+ ADM &	+ ADM &	+ ADM &	+ ADM &	ADM &	+ ADM &	+ ADM &	+ ADM &	+ ADM &	+ ADM &	+ ADM 8	+ ADM &	+ ADM &					
BLDG DESCRIPTION	OC IN NO	BN HO BLDG	NO O/	NIO O/	NO O/	NIO O/			NIO O/	NIC O/	/O DIN	0	NIO O	NIO O/	NIO O/			NIO O	NO ON	NO O/	NIC O//	//O DIN	NIO O//	NO O/	NO DIN	NO ON	NIO O/	NO 0/	N C	NIO O	NO ON	NIO O/	NIG O/	VIO DIN	V/O DIN	NIO O/N	V/O DIN	V/O DIN	NIO O/A	NO DIN	NO DIN	NO ON					
			ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	EN BK W/O DIN + ADM & SUPP.	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM &	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPI	EN BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	EN BK W/O DIN + ADM & SUPP	EN BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL
NO.	000	10230		10232 EN			10232 E1					_	10232 EI	10232 EI	10232 EI							10232 EI	10232 E				10232 E	10232 E		10234 E			10234 E							10234 E		10234 E					
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SIMPLE	2	0 0	5.6	A/N	46.1	N/A	N/A	N/A	18.4	1.3	NA	0.4	A/N	0.0	0.4	4.0	0.0	<u> </u>	3 5	0.2 N/A	7 7	NA	0.5	8.1	1.2	N/A	0.4	NA	NA	15.8	0.0	NA N	5.1	NA	0.4	N/A	5.6	0.4	13.5	0.5	N/A	0.1	NA	13.5	0.2	13.5	N/A	20.0
SIS T	7	- 6	16	N/A	0.2	N/A	N/A	N/A	0.5	6.7	ΑX	21.0	Ψ,	11.3	24.0	24.0	2 2	16.7	38.4	N/A	67	N/A	16.0	1.1	7.3	ΑN	23.2	ΑN	Ϋ́	9.0	14.0	Y X	1.7	ΑN	20.2	N/A	1.6	20.2	0.7	52.6	N/A	63.2	ΑX	0.7	52.6	0.7	¥ c	52.0
TOTAL 5 DISC. SAVING	587	5.496	567	512	148	284	512	512	133	2,448	512	12,707	512	40.544	40,014	10,034	3,000	5 871	28 835	5712	2 444	512	12,119	392	4,411	512	6,693	512	1,811	431	8,087	512	1,329	512	5,846	512	1,224	5,845	237	39,801	512	47,747	512	237	39,801	237	512	39,331
TOTAL BLDG. INST. COST :	263	604	363		773				289	363		604	000	303	000	000	202	262	75,6	3	363		756	363	604		289			773	3/6	1	773		289		773	289	363	756		756		363	756	363	26.3	756
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\$ COST SAVING PER YR	64	627	64	09	17	32	8	90	16	278	09	1,469	3 8	2 133	2,133	4, 134	£ 6	999	3330	6	277	8	1,400	45	516	9	767	8	206	49	£ £	8 8	151	9	069	99	139	069	27	4,695	9	5,633	8	27	4,695	27	5 5	4 641
LABOR HOURS SAVING PER YR				3			3	က			က	(2				~	,		6		3				3		3				3		3		က					3		3				3	
MBtu LPG SAVING PER YR																																																
MBtu F. OIL #2 SAVING PER YR					-				-								-																															
MBtu District Htg SAVING PER YR	14.60	121.40	14.60		3.80	7.30				63.00	9	1/4.40	407.00	296.20	264 30	94 40	2	151.10	418.10		62.90		174.20	10.10	27.90		128.90		46.60	11.10	14.70		34.20				31.50		6.10	24.10		24.10		6.10	24.10	6.10	3.10	12.00
KWh C SAVING PER YR		1,683.00							287.50		01 000 07	12,801./0		15 122 30	18 308 00	20.000			27,177,00				11,550.20	-	7,181.90		3,637.00			42 646 70	3				12,617.00			12,616.70		83,884.90		101,035.00			83,884.90			83,884.90
KW SAVING PER YR																																																
EMCS FUNC.	3	-	3	4	7	7	4	4	-	ю.	4		1 (7	1	- 6	9	3	-	4	6	4	-	က	-	4	-	4	e 1		- m	4	7	4	-	4	7	-	က	-	4	-	4 (e .	- (m 4	4 (, -
SYSTEM I	-	-	1	-	6	12	o !	12	σ.		- '	- (7 C	1 0	2 0	, ,	2	2	2	2	2	2	2	-	-	-	თ	6	6	9 5	12	12	6	6	6	6	6	6	2	2	2	7 0	2 0	2	2	2	10	2
SYSTEM	AHU-8	AHU-9	AHU-9	AHU-9	H-1	出	出.	出!	出:	AHU1	AHU1	AHU	אַרוע אַ	AHI 12	AHI 13	AHI 13	AHUS	AHU4	AHU4	AHU4	AHUS	AHU5	AHU5	AHU6	AHU6	AHU6	띺	핖	포 !	里	HTPI	HTP1	HTP2	HTP2	HTP2	нтРЗ	нтРЗ	HTP3	¥	¥	Ξ	Z 2	£ 2	£	1 A3	E H	Z Z Z	HV4
BLDG DESCRIPTION	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENI, BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL PERS DIN	ENL PERS DIN	ENL PERSON	ENL PERS DIN	ENI DEBS DIN	ENI DEBS DIN	ENI DEBS DIN	ENI PERSONA	ENL PERS DIN	ENI PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP
BLDG No.	10234	10234	10234	10234	10234		10234	10234	10234	10250	10250	10250	10200	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10250	10270	10270	10270	10270	10270	10270	10270	10270	10270	10270	10270	10270	10270	10270	10270	102/0	10270	10270

E-2	ISTED BY BUILDING
TABLE	SYSTEM SUMMARY L

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pini jar	 ≅	Z N/A			Z Z				2 N/A	Ĺ	8 44.5		Ľ				1	0 C	Ľ	Ш	\perp		Z Z				0.1	L		$oxed{oxed}$	3 17.0 7 N/A	_		\perp	\perp	8 8 5				1	9 5.4 N/A	L	1
s DISC.	SAVING	512	144	26,888	512	26 608	2	144	512	26,888	26,888	212	26,608	70	512	512	26,794	512	13.921	47	443	9,673	512	3312	85	512	2 469	512	1,589	21,586	10,283	493	93	3,428	512	212	74	512	1,756	23,773	2,359	512	
	COST		363	604		604	363	363		604	604	262	604	363			604	202	604	363	363	604		604	363		773	607	472	576	604	363	363	604		289	773		472	576	433		
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Allegang &	PEK YK	9	16	3,172	20 60	3,140	8	16	09	3,172	3,172		3,140	8	09	99	3,161	6	1,643	5	20	1,116	8 8	386	10	9	294	9	180	2,455	1,185 60	99	1	333	09	291	80	09	199	2,704	279	09	
HOURS	PER YR	င		1	2 ")			3		~	2			3	က		6				C	2 "	,		3		6			6				m (7		3			m	8	
	TEX X X																																										
F. OIL. #2 SAVING	PER YR																											;												:			
District Htg SAVING	rek tk		3.70	14.40		7.20	1.80	3.70		14.40	14.40	3.70	7.20	1.80			12.00	5	4.80	1.20	11.40	147.60		28.10	2.20		1.90		40.90	527.00	163.30	12.70	2.40	31.10			1.90		45.20	583.30			
SAVING	TEX T			26,826.30		56,826.30				56,826.30	56,826.30		56,826.30				20,820.30		29,644.00		701	0/.100,8		4,791.40			5328 60	20,040,0		2,397.80	6,501.70			4,791.40		5,328.60			00.000	2,397.80	5,092.00		
SAVING																																											
EMCS) 2 2	4	ε,		4 4	-	3	3	4	-	- 4	9	_	3	4	4	- "	4	-	3	e -		1 4	-	3						4				4 4		7				- 4		
SYSTEM EMCS		2	-				1	1		-			1	1	-				-	-			-		-	5	n o	12	12	12		1	٢	•	- 0	0	6	12	12	12	14	-	
SYSTEM	NAME	HV4	MAU1	MAU	MAU	MAU2	MAU2	MAU3	MAU3	MAU3	MAU4	MAU4	MAUS	MAUS	MAU5	MAU6	MAUS	MAU7	MAU7	MAU7	AHU1	AHUI	AHI 12	AH02	AHU2	H.	Ŧ	HE2-PER	HE2-PER	HE2-PER	AHC THE	AHU1	AHU2	AHU2	AHU2	뿐	HE1	HE2-PER	HE2-PER	HE2-PER	AHU-1	AHU-10	
	Z 2	r SHOP	SHOP	SHOP I	SHOP .	SHOP	r SHOP	T SHOP	T SHOP	SHOP	SHOP	SHOP	r SHOP	T SHOP	T SHOP	TSHOP	SHOP	SHOP	T SHOP	T SHOP	BLDG	BLDG	al De	BLDG	BLDG	BLDG	BLDG BLDG	BLDG	BLDG	BLDG	EDG.	3LDG	3LDG	3LDG	3LDG	3LDG	3LDG	3LDG	3LDG	3LDG	ADM & SUPPL	ADM & SUPPL	
BLDG	DESCRIPTION	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	BDE HQ BLDG	BDE HO BLUG	BUE HG BLUG	BDE HQ BLDG	BDE HO BLDG	BDE HQ BLDG	BDE HO BLDG	BDE HO BLDG	BDE HO BLDG	BDE HO BLDG	BN HQ BLDG	BN HQ BLDG	BN HO BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	ENL BK W/O DIN + ADM & SUPPLEN BK W/O DIN + ADM & SUPPLEN	ENL BK W/O DIN + ADM & SUPPL	
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	SIMPLE	414	A/N	1.0	NA	1.6	N/A	1.6	5.9	1.0	N/A	5.9	1.0	NA	W.W	1.0	5.0	0.14	¥ 4	5.0 V/V	Y Y	18.4	A/N	46.1	1.6	N/A	6.0	N/A	NA	6.0	1.6	Y N	1.6	1.6	N/A	5.5	0.9	NA	0.0	NA NA	5.5	N/A	5.5	6.0	5.5	NA	18.4	A Z
	E E	4114	¥ 5	2 4	¥.	5.4	N/A	5.4	1.5	8.7	N/A	1.5	8.7		₹ ¦	20	0.10	0 2	7 4	2 0	2 2	0	₹ N	0.2	5.4	ΑN	9.8	ΑN	∀ N	8.6	5.4	Y X	5.4	5.4	N/A	1.6	9.3	A/A	6.3	ĕ.	9. 6	0.9 V/V	19	93	1.6	Ν	0.5	A A
TOTAL S	DISC. SAVING	5	512	2.359	512	2,359	512	2,359	540	5,275	512	540	5,275	512	512	C/7'C	040	547	540	284	512	133	512	148	2,359	512	3,547	512	512	3,547	2,359	512	2,359	2,359	512	583	5,621	212	5,621	512	583	512	583	5.621	583	512	133	284
TOTAL BLDG.	INST. COST			433		433		433	363	604		363	604		3	904	303	5	363	3		289		773	433		363			363	433		433	433		363	604	1	604	1	363	5	363	604	363		289	
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	SAVING PER YR	٣	6		Э		9				က		•	2 (0			6			6		3			3		3	3		"	3			3		ſ	2	0	2		3				3		3
MBtu LPG	SAVING PER YR																																															
MBtu F. OIL #2	SAVING PER YR										-																																					
MBtu District Htg	SAVING PER YR								13.90	115.70		13.90	115.70		115.70	13.00	115.70		13.90	7.30				3.80			91.30		200	91.30					!	15.00	124.60	124 60	124.00	15.00	124 60		15.00	124.60	15.00		100	05.7
J. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	SAVING PER YR			5,092.00		5,092.00		5,092.00		1,683.30		0000	1,683.30		1 683 30	00000	1 683 00					287.50			5,092.00					00 000	3,032.00		5,092.00	5,092.00		1 000 00	1,683.30	1 603 30	1,000.30		1 683 30			1,683.00			287.50	
Ke	SAVING PER YR																																															
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Į	NUMBER FUNC.	-	14	14	14	14	14	14	-	-	-	- '			-	-	-	-	-	12	0	თ	12	o	14	4	-		- -		4 4	14	14	14	14		-	-		-	-	-	1	1	-	- (9	6
į	NAME	AHU-11	AHU-2	AHU-2	AHU-3	AHU-3	AHU-4	AHU-4	AHU-6	AHU-6	AHU-6	AHU-7	AHU-/	a	AHI A	AH La	AHI LO	AHU-9	AHU-9	표 1-표	<u>부</u>	Ψ-	H-1	HE-1	AHU-1	AHU-1	AHU-10	AHU-10	AHU-11	AHU-11	AHU-2	AHU-3	AHU-3	AHU-4	AHU-4	AHU-6	AHCO	2 2	AH11-7	7-1-1-4	AHU-8	AHU-8	AHU-8	AHU-9	AHU-9	AHU-9	보 :	¥ 1 1
	DESCRIPTION	FNI BK W/O DIN + ADM & SUPPL	BK W/O DIN + ADM &	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BY W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL DA WOO DIN + ADM & SLIPPL	ENERGY WIND THE ADM & SLIPPI	ENI BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	BK W/O DIN + ADM &	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	CALL DAY WOODIN - ADM & COLOR	ENL BK W/O DIN + ADM & SLIPPI	ENL BY W/O DIN + ADM & SUPPL	ENCENCENCY ADM & SOPPLEMENT BY W/O DIN + ADM & SUPPLEMENT BY W/O D	ENL BK W/O DIN + ADM & SUPPL	10414 ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	10414 ENL BK W/O DIN + ADM & SUPPL
	NO.	10412			10412				10412					10412					10412				10412	10412	10414					10414			10414			10414	10414	1011	10414	10414				10414	10414	10414		10414

SIMPLE	PAYBACK	46.1	N/A	6.5	0.5	N/A	N/A	34.3	1.5	N/A	92.3	1.0	0.2	₹ ?	7.7	7.7	Z/A	0.7	12	7.0	7.0	1.2	N/A	N/A	1.0	1.0	N/A	NA	18.4	60.4	35.B	1.3	ΑN	0.4	1.5	¥	0.5	- 0	0.0	1	0.3	N/A	0.7	2.6	N/A	NA F	- 0	N/A
1 3 4 .	SIR P	0.2	N/A	1.4	17.0	A/A	N/A	0.3	5.7	ΑN	0.1	8.5	41.3	A C	7.0	0./	N/A	5. N	7.6	5 6	1.3	7.6	ΝA	N/A	9.0	9.0	N/A	N/A	0.5	0.4	Z C	6.7	N/A	22.1	5.9	¥ į	17.2	7.0	- W	83	27.6	N/A	11.7	3.4	¥.	Α C	0.0	N/A
TOTAL \$ DISC.	SAVING	148	512	493	10,283	512	512	93	3,428	512	74	2,469	23,773	212	00/1	4,080	212	542	4 580	455	455	4,580	512	512	3,283	3,283	512	512	133	113	190	2.448	512	13,344	2,125	512	13,005	1,011	512	2 999	20,898	512	8,813	1,251	512	512	3 883	925
	COST	773		363	604			363	604		773	289	576	477	7/4	904	263	SOS	604	363	363	604			363	363			289	773	773	363		604	363		756	202	90,	363	756		756	363		363	303	5
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SAVING	PER YR			ų,	1,185		u		33	Û		291	2,704		2 6	2			52	4,	4,	52	9		3/	37	a					27	6	1,545	241		1,508	7 204	, , ,	340	2,429	9	1,025	17			46	۲
LABOR HOURS SAVING	PER YR		3			3	3			3			C	2		~	0	۳.					3	3			3	3		٣	0		3			3			6	-		3			3	2		
MBtu LPG SAVING	PER YR																																															
MBtu F. OIL #2 SAVING	PER YR		***************************************																																•													
MBtu District Htg SAVING	PER YR	3.80		12.70	163.30			2.40	31.10		1.90	000	283.30	15.20	07.20	20.76	11 70		97.80	11.70	11.70	97.80			84.50	84.50			6	2.90	4 90	63.00		174.40	54.70	4	134.40	133.60	00.00	77.20	213.80		89.10	32.20		5.40	14 30	23.80
78 97 92 52	PER YR			:	8,501.70				4,791.40			5,328.60	7,387.80		1 683 30	2000.00			1,683.30			1,683.30							287.50				:	14,177.20		70.000	15,122.30	18 308 00	3		27,177.00		11,550.20				7.181.90	
	UNC. PER YR	7	4	3	-	4	4	3	-	4	7	- -		7 7	2	4	1 6	4	1	3	3	1	4	4	3	3	4	4	- 1	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	7	3	4	-	ε.	4 ,	- 6) +	4	3	-	4	-	3	4	4 6	2 -	3
SYSTEM	NUMBER FUNC.	6	12	-	-	-	-	-	-	6	6	o (77	1 5	7 -	-	-	-	-	-	-		-	-	-	-	-	6	o 0	5 0	0	-	-	-	2	7	7 0	1 0	2 2	2	2	2	2	2	2	-	-	6
	NAME	HE-1	H-1	AHU1	AHU1	AH01	AH02	AHU2	AHU2	밀	Ή	H.	HEZ-PEK	HE'S DEP	AH 1.1	AHIT.	AH1-1	AHU-2	AHU-2	AHU-2	AHU-4	AHU-4	AHU-4	AHU-5	AHU-5	AHU-6	AHU-6	H-1	¥	H H	HE-2	AHU1	AHU1	AHU1	AHU2	AHUZ	AHU2	200	AHU3	AHU4	AHU4	AHU4	AHU5	AHU5	AHU5	AHI IS	AHU6	HE1
	DESCRIPTION	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG.	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG		BN HQ BLUG		iggi io a	ENC BY W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	EN BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPLENI BK W/O DIN + ADM & SLIPPI	FNI BK W/O DIN + ADM & SUPPL	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	Chi prop Div	EN PERSON	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENE PERS DIN	ENL PERS DIN
BLDG	Š	10414 EN	10414 EN	10420	10420	10420	10420	10420	10420	10420	10420	10420	10420	10470	\neg					-1		10422 EN	10422 EN		10422 EN	10422 EN		10422 EN		10422 EN	10422 EN	10450	10450	10450	10450	10450	10450	10450	10450	10450	10450	10450	10450	10450	10450	10450	10450	10450

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SIMPLE	9.0	N/A	15.8	5.8	9.0	N/A	5.1	0.4	Ν	5.6	0.4	NA	10.8	0.2	N/A	0.1	NA	10.8	N/A	10.8	2.0	N/A	21.7	0.2	N/A	17.9	N/A	0.2	35.8	NA	17.9	0.2	17.9	A/N	35.8	0.2	21.7	N/A	0.2	N/A	0.4	54.9	U.b	6.7	0.4	A/N	2
<u> </u>	14.7	N/A	9.0	1.5	15.0	ΑN	1.7	20.2	N/A	1.6	20.2	ΑX	0.8	52.9	ΑX	63.5	Ψ.N	8 5	A/A	ρ. Ο (52.3	32.2 N/A	0.4	44.7	A/A	0.5	N/A	44.2	0.7	N/A	0.5	44.7	0.5	Y V	0.0	44.2	0.4	N/A	44.5	ΑN A	23.1	0.2	14.4 N/A	13	20.2	Y N	2
SAVING	4,245	512	431	711	8,627	512	1,329	5,845	512	1,224	5,845	512	295	40,022	512	47,968	512	C67	71.0	CR7	30,022	547	148	27,024	512	179	512	26,674	27 024	512	179	27,024	179	512	8	26.674	148	512	26,907	512	13,967	28	8,266	512	5,846	512	210
BLDG. INST. COST 8	289		773	472	576		773	289		773	289		383	756		756	1	363	000	205	756	900	363	604		363		904	363	5	363	604	363		363	604	363		604		604	363	9/6	472	289		
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COST SAVING PER YR	490	9	49	8	1,006	09	151	069	09	139	069	9	34	4,720	09	5,658	9	\$ 8	2 8	47.70	4,720	4,00,4 60	17	3,187	90	20	89	3,148	3 187	9	20	3,187	20	8 6	\$ 6	3.148	17	9	3,174	90	1,648	7	965	20	069	09	3
HOURS SAVING PER YR		က				3	-		3			3			8	(e	C	2		-	С.	>		3		3			6			(2 6				3		е			٣	2		3	,
LPG SAVING PER YR																																											I				
F. OIL #2 SAVING PER YR													1									-																									
District Htg SAVING PER YR	65.90		11.10	18.30	71.60		34.20			31.50		1	7.60	29.80		29.80	1	09.7	1	00.7	14 90	200	3.80	17.90		4.60		8.90	17 90	3	4.60	17.90	4.60		2.30	8.90	3.80		14.90		00.9	1.50	62.30	15.90	2		00.0
	3,637.00				12,616.70			12,616.70			12,616.70			83,884.90		101,035.00				00 000 00	83 884 an	00,00		56,826.30				56,826.30	56 826 30	20,02		56,826.30				56,826.30			56,826.30		29,644.00	02 070 07	12,616.70		12,617.00		
KW SAVING PER YR													1.																													1					1
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SYSTEM NAME	HE1	뜌	Ή	HTP1	HTP	HTP1	HTP2	HTP2	HTP2	HTP3	HTP3	HTP3	<u>₹</u>	¥	¥	H72	HV2	7AE	2 2	EVE S	2 3	1/4	HV4	MAU1	MAU1	MAU1	MAU2	MAU2	MAU2	MAU3	MAU3	MAU4	MAU4	MALIS	MALIS	MAUS	MAUG	MAUG	MAU6	MAU7	MAU7	MAU7	HIP	표 전	HTP2	HTP2	1111 2
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BLDG DESCRIPTION	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAIN SHOP	VEH MAIN SHOP	VEH MAIN SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	ביים ואוטאו ביים
BLDG NO.	10450	10450	10450	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	104/0	10470	104/0	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10470	10480	10480	10480	10480	20+01

TABLE E-2

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S R	ΝV	1.6	20.2	0.7	52.7	NA S	53.3	200	52.7	0.7	¥ X	N/A	0.4	52.1	Ν	0.4	44.6	0.2	NA	1.1	Ψ,	0.44.0	7 0	44.6	§ Ž	0.2	Ϋ́	44.1	¥.	0.4	4.4	5 2	73.4	12	16.0	¥	5.5	Ν	0.2	8.5	C. 3	37.5	S X	3.4	0.8	2.4
TOTAL S DISC. SAVING	512	1,224	5,845	256	39,875	512	178,14	547	39 875	256	512	512	128	39,370	512	155	26,934	78	512	26,631	212	155	3 5	26.934	512	78	512	26,631	512	128	20,833	512	13 936	443	9.673	512	3,312	512	82	2,469	71.7	21 586 21 586	512	1,589	531	1,255
TOTAL BLDG. INST. COST (773	289	363	756	7	363	205	756	363			363	756		363	604	363		604	200	36.	363	604		363		604	8	263	26.2	33	604	363	604		604		363	289	2)	576	5	472	647	534
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COST SAVING PER YR	09	139	069	29	4,703	5 641	20,0	9	4,703	29	09	99	15	4,646	90	18	3,177	6	09	3, 143	3 177	9	18	3,177	90	6	9	3,143	9	2 466	5	9	1,644	20	1,116	90	386	8	9 2	291 8	° 09	2.455	90	180	63	142
HOURS SAVING PER YR	3				c	9		8			3	9			က			•	8	~	2				3		3	,	E)			3				3		3	+		3	,	3			
LPG SAVING PER YR																																														
F. OIL #2 SAVING PER YR																																														
District Htg SAVING PER YR		31.50		09.90	70.00	26.00	6.60		26.00	09.9			3.30	13.00		4.00	15.60	2.00	7 90	20:-	15.60	4.00	4.00	15.60		2.00		D8.	3.30	13.00	1.30		5.20	11.40	147.60		28.10	0	2.20	1 90	2	527.00		40.90		32.30
KWh SAVING PER YR			12,616.70	00 60 60	03,004.30	101.035.00			83,884.90					83,884.90		00 000	26,826.30		56 878 30	20,020	56 826 30			56,826.30			0000	26,826.30		56 826 30	200		29,644.00		8,501.70		4,791.40		5 328 BD	0,020,00		2,397.80			1,146.50	
KW SAVING PER YR																																							1							
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SYSTEM EMCS NUMBER FUNC.	6	6	6	7	2	2	2	2	2	2	2	2	2	2		-	- -	- -		-	-	1	+	+	-			- -	-	-	-	-	-	1	-	-	-	-	- σ	0	6	12	12	12	4	4
SYSTEM	НТРЗ	НТРЗ	HTP3		ž	HV2	HV2	HV2	HV3	¥3	£	HV4	HV4	HV4	MAU1	NAC 14	IN TOTAL	MALIS	MALIZ	MAU3	MAU3	MAU3	MAU4	MAU4	MAU4	MAUS	MAUS	SO TAN	MAUG	MAUG	MAU7	MAU7	MAU7	AHU1	AH01	AHC1	AHU2	AHUZ	APIUZ HF1	至	里	HE2-PER	HE2-PER	HE2-PER	AHU1	AHU1
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BLDG	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAIN SHOP	VEH MAINI SHOP	VEH MAIN! SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	BDE HQ BLDG	BDE HQ BLDG	BDE HQ BLDG	BDE HQ BLDG	BOE HO BLUG	BDE HO BLDG	BDE HQ BLDG	BDE HQ BLDG	BDE HQ BLDG	BDE HQ BLDG	BDE HQ BLDG	OPEN DIN CONSOL	OPEN DIN CONSOL
	0.	0	2 0	2 0	0.0	0	0		٥																									0	0	0 ,	0 ,	0 0		0	0	0	В			
BLDG NO.	10480	10480	10480	10480	10480	10480	10480	10480	10480	10480	10480	10480	10480	10480	10480	10400	1046	10480	10480	10480	10480	10480	10480	10480	20	10480	10480	10480	10480	10480	10480	10480	10480	10500	10500	10500	10500	1000	10500	10500	10500	10500	10500	10500	10502	10502

SIMPLE SIR PAYBACK	14.1		N/A	4.1	16.2	5.6	. 32.6	N/A	N/A	N/A	26.4 0.3	3.6	N/A	0.5 18.6	5.7	5.7	N/A	1	N/A	0.5	6.0	8.6	N/A	N/A	9.0 0.9	12.6	N/A	N/A	29.3	N/A N/A	- X	4.8	17.0	1.4	ΝΑ		N/A	0.1	NA		3.7	N/A N/A		N/A
FOTAL \$ DISC. SAVING	8.241	_	512					1,296	512		15,958		Ш	310		2	512	,				2	324	1	2,602	<u> </u>	512	_	۳	132	_		10,283		_	3,6	512		Ш			512	4	517
TOTAL BLDG. INST. COST	584		:				604				604	534		905	383	383			3	602		578			289				2 576	277	7//	289	604	1 363		1 604	<u> </u>	2 773		289	1 472	2 576		_
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\$ COST SAVING PER YR	957	113	9	247	1,118	342	2,286	153	9	9	1,853	219	9	3	259	25	ی او	350	3 9	3	90	99	6	9	307	797	9		1,918			1	1,185	"		86				25	7	09 2	7,7	_
LABOR HOURS SAVING PER YR			3						3	3			3						е		3			3			3	3			6			:	3		6		3			3		~
MBtu LPG SAVING									-																																			
MBtu F. OIL #2 SAVING PER YR														7.60			100	00.7		7.60																								
MBtu District Htg SAVING PER YR	87.50			56.10	196.70	77.60	210.00				174.20	49.60													74 50				D4	3.40	1.40		163.30	12.70		31.10	2.40	1.90			45.20		3	
KWh SAVING PER YR	9.855.20	2,063.70			3,223.10		23,506.40	2,797.50			18,468.20	1,034.40			4,741.30	4,741.30		A 744 30	t .			10,809.90	698.60		5,046.70	13,613.80			2,375.80			2,975.50	8,501.70			4,791.40				5,328.60		2007	2,337.00	
KW SAVING PER YR	4.7				10.8	\vdash	10.8				10.8											10.8			4.5	2																		
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SYSTEM EMCS. NUMBER FUNC.	4	6	3	3	3	3	က	3	3	က	e (n (n	19	10	10	10	10	20 5	9 9	10	8	8	8	=	1	9 6	3	12	12	12	ס ס	6	-	_				6	6	6	12	12	71	7
SYSTEM NAME	AH(11	AHU2	AHUZ	AHU2	AHU2	AHU3	AHU3	AHU3	AHU3	AHU4	AHU4	AHI 14	B4	<u>8</u>	B1	B2	B2	29 82	3 8	8	WC1	WC1	WC1	ACCU-1	ACCU-1	AHO1	AHU1	포	Ŧ	里	HEZ	ΞΞ	AHU1	AHU1	AHU1	AHN2	AHU2	出	里	里	HE2-PER	HE2-PER	חבל-דבת	71117
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BLDG DESCRIPTION	IOSNOO NIU NEGO	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	OPEN DIN CONSOL	CLINICS W/O BEDS	CLINICS W/O BEDS	CLINICS W/O BEDS	CLINICS W/O BEDS	CLINICS W/O BEDS	CLINICS W/O BEDS	CLINICS W/O BEDS	CLINICS W/O BEDS	CLINICS W/O BEDS	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HO BLDG	BN HQ BLDG	BN HO BLDG	BN HQ BLDG	BN HQ BLDG	SOLID BILDS	ימנו ני פי אניט פייאר אים וייד
BLDG NO.	10507	10507	10502	10502	10502	10502	10502	10502	10502	10502	10502	10502	10507	10502	10502	10502	10502	10502	70507	10502	10502	10502	10502	10506	10506	10506	10506	10506	10506	10506	10506	10506	10510	10510	10510	10510	10510	10510	10510	10510	10510	10510	10510	0,70,

SIMPLE		N/A	1.0	N/A	AN AN	1.6	NA	N/A/A	1.6	6.2	N/A	1.0	6.2	AN .	0.0	NA	1.0	6.2	N/A	1.0	46.1	18.4	N N	NA.	NA 1	N/A	7.3	1.2	7.3	A/N	73	1.2	1.0	N/A	N/A	1.0	18.4	N/A	60.4	35.8	¥ ×	¥ 4	0.5	34.3	1.5	A/S
<u>s</u>		N/A	8.6	A A	Ş X	5.4	NA	N/A	5.4	1.4	AN N	8.4	1.4	A/A	4 6	Y N	8.4	1.4	ΝA	8.4	0.2	0.5	¥.	¥.	A V	X	1.2	7.4	1.2	K V	12	7.4	8.7	A/N	A/A	8.7	0.5	A/N	0.1	0.2	¥ ×	<u> </u>	17.0	0.3	5.7	¥ v
TOTAL \$ DISC. SAVING		512	3,135	212	512	2,359	512	512	2,359	513	512	5,061	513	216	513	512	5,061	513	512	5,061	148	133	512	284	4 451	512	439	4,451	439	512	439	4,451	3,174	512	512	3,174	133	512	113	190	512	715	10.283	93	3,428	512
BLDG. INST. COST			363	433		433			433	363		604	203	100	363		604	363		604	773	288			604		363	604	363		363	604	363			383	588		773	773	+	363	604	363	604	277
A POINT		1		-		+			-	-	1		†	-	-		-	-		-	2				F			-	+		-	-	-		+	-	1	1	7 (7	+	-	-	-		r
D DINT				-		-			-		1			-	-		1			-		-			+			-				-				1	+	+	1	\dagger	-		-		=	\dagger
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COST SAVING PER YR	8	OGC OG	999	279	09	279	90	9	279	28	60	0 20	8 6	578	28	09	578	28	8	8/6	2 4	2 6	3 8	25	509	9	22	209	2 6	8 8	20	209	360	8 8	3 8	200	9 8	3 8	2) 22	77	8 8	56	1,185	+	336	00 %
HOURS SAVING PER YR	٢	2	3		3		3	3		1	2		m			3			3			7	2	6		3			6	6				m (8		6	2		6	9 6			+		8
LPG SAVING PER YR																																														$\frac{1}{1}$
F. OIL #2 SAVING PER YR																																-														
District Htg SAVING PER YR		80.70							13.20	13.20	110.20	13.20		110.20	13.20		110.20	13.20	140.20	3.80	2000		7.30		94.50		11.30	94.50	00.1		11.30	94.50	81./0		81 70			2 90	4.90			12.70	163.30	2.40	31.10	1.90
KWh SAVING PER YR				5,092.00	0000	2,092.00		5,002,00	2,032.00		1,683,30			1,683.30			1,683.30		1 683 00	2000	287 50		1		1,683.30		70000	1,083.30				1,683.30				287.50	20.						8,501.70	4 704 40	4,791.40	
KW SAVING PER YR																																	\dagger													
	4	3	4	-	4	-	1 4	4 -	- 6	4	-	3	4	-	3	4	- 0	2	1 +-	7	-	4	7	4	~	4	2) 4	- (~	4	4	e .	- 6	2 4	4	3		4	7	_	4	4	က	-	6 -	-	7
SYSTEM EMCS NUMBER FUNC.	-	-	-	14	14	4 2	1 7	1 4		-	-	-	-	-	-		- -	- -	-	0	6	6	12	12	-	-	- -	-	-	-	-		- -	-	-	0	6	6	6	6	-	-	-			- 6
SYSTEM	AHU-10	AHU-11	AHU-11	AHU-2	AHU-2	S III	2017	AHI1-4	AHU-6	AHU-6	AHU-6	AHU-7	AHU-7	AHU-7	AHU-8	AHU-8	AHC-8	8-0117	AHU-9	出	五.开	HE-1	HE-1	H-1	AHU-1	AHU-1		AHU-2	AHU-2	AHU-4	AHC-4	AHU-4	AHIL5	AHU-6	AHU-6	1	五五	₩ ₩	HE-2	HE-2	AHU1	AHC1	AHU1	AHI 12	AHI 17	HE1
BLDG DESCRIPTION	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL			ENL BK W/O DIN + ADM & SUPPL ENI BK W/O DIN + ADM & SLIDBI			_			집	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL						ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	10514 FNI RK W/O DIN + ADM & SLIDDI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	EN BK W/O DIN + ADM & SUPPLEM BK W/O DIN + ADM & SI IDPLEM	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	SOLING CH NA	BN HQ BLDG
BLDG No.	10512	10512	10512	10512	10512	10512	10512	10512	10512	10512	10512	10512	10512	10512		10012	10512			10512		10512				10014	10514	10514			10514				10514	10514	10514	10514			10520	10520	10520	10520	10520	10520

TABLE E-2 YSTEM SUMMARY LISTED BY BUILDIN
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SIMPLE SIR PAYBACK	10	A/N		N/A N/A								7.8			8.4 1.0				0.7		0.2 35.8					1.2 N/A		7.4 1.2			N/A N/A	N/A 1.0						10.6						N/A N/A
SAVING	2 469	512	1,756	512	23,773	423	512	4,727	423	4,727	512	4 777	423	512	3,046	512	3,046	212	133	3 6	196	512	4,455	443	512	547	4,455	4,455	443	512	512	517	3,174	113	512	133	512	2 680	18,223	512	512	12,707	2,448	212
BLDG. INST. COST	289		472		576	363		604	363	604		604	363		363		363	77.0	280	289	773		604	363	55	505	604	604	363		Coc	303	363	773		289	77.0	534	604			604	363	
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COST SAVING PER YR P	291	99	199	09	2,704	48	3	240	48	540	09 69	540	48	9	346	99	346	3 6	3 4	2 ~	22	09	209	20	8 8	8 6	509	209	20	8 8	000	09	360	13	09	16	8 8	645	2,080	09	8	1,469	278	3
HOURS SAVING PER YR		3		3		C	2)			•	E 6	>		3		3		2				3			8	3				e (2	3			6		6			3	3		٣	2
LPG SAVING PER YR																																												
F. OIL #2 SAVING PER YR									Ļ																																			
District Htg SAVING PER YR			45.20		583.30	10.90	00 707	101.60	10.90	101.60		101.60	10.90		78.40		78.40	2 90			4.90		94.60	11.40	11 10	2	94.60	94.60	11.40		84.70	5	81.70	2.90			60 1	146.20	404.80			174.40	63.00	
KWh SAVING PER YR	5,328.60				2,397.80		S	1,683.30	4 600 00	1,583.30		1,683.30							287.50	129.40			1,683.30				1,683.30	1,683.30								287.50			5,386.40			12,801.70		
KW SAVING PER YR																																												
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A SYSTEM NUMBER																4	1							-	-					-													1	+
SYSTEM	HE	Ή	HE2-PER	HE2-PER	HE2-PER	AHU-1	T T	AHU-1	AHO-7	AHO-Z	AHU-4	┼	AHU-4	_	-	1	AHU-6	¥	¥		HE-2		AHU-1	AHC-1	AHU-1	+	\vdash	AHU-4	AHU-4	AHU-4	+	-	AHU-6		1	¥ !	HE-2	AHU-1	AHU-1	AHU-1	AHU1	AHC1	AHU1	7-000
BLDG DESCRIPTION	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O UIN + AUM & SUPPL	ENL BK W/O DIN + ADM & SUPPL FNI BK W/O DIN + ADM & SLIPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENTERN WOODIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL				ENL BK W/O DIN + ADM & SUPPL					ENL BK W/O DIN + ADM & SUPPL			ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	Ä		ENL BK W/O DIN + ADM & SUPPL		ENL PERS DIN	ENL PERS DIN			ENL PERS DIN	CINE PERS DIIV
BLDG NO.	10520	10520	10520	10520							10522			10522			10522			_	10522				10524			10524	10524	10524			10524	10524	10524	10524	10524	10550	10550	10550	10550	10550	10550	2

SIMPLE	PAYBACK	NA	6.0	0.4	0.8	2.8	N/A	N/A	1.0	0.4	N/A	4.	0.4	7.0	N N	NA	1,6	9.0	ΑX	3.0	10.9	9.8	Y .	1.2	20 2	N/A	2.7	N/A	15.8	N	4.0	7.3	2 X	5.1	0.4	N/A	5.6	N/A	0.4	13.5	0.2	ΝΑ	0.1	13.5	0.2	Y V
- A. S. L. 1970	Z Z	ΑΝ	9.6	22.0	10.7	3.1	ΝΑ	NA	8.5	22.5	NA	6.1	20.5	13.6	S X	₹ N	5.7	14.6	ΑX	2.9	0.8	0.9	Ψ.	0.7	3.5	Z Z	33	N/A	9.0	K/A	20.4	12	Y.N	1.7	20.2	N/A	1.6	Y S	20.2) O	52.6	N/A	63.1	0.7	52.6	N/A
DISC.	SAVING	512	3,485	16,657	6,466	1,663	512	512	3,077	16,999	512	3,283	12,411	4 973	512	512	2,051	11,028	512	1,753	431	326	512	4,23/	3,324	512	1,539	1,519	431	512	5,885	571	512	1,329	5,846	512	1,224	512	5,845	512	39.793	512	47,739	237	39,793	212
BLDG.	- 656		363	756	604	534			363	756		534	504	363	3		363	756		604	534	363	3	57g	0/0		472		773		289	472		773	588		773	000	289	363	756		756	363	756	200
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HOURS SAVING PER VR	ו אין	3					က	9			8				8	3			က			. '	m			3			1	e			3			e		3		6		3			-	2
LPG SAVING PER YR	ובת זוג																																													
F. OIL #2 SAVING PER YR		1										1																																		
District Htg SAVING PER YR	L .		89.70	248.40	118.40	42.80			79.20	219.20		84.50	350 70	126.70			52.80	146.10		30.70	11.10	8.40	73 40	109 10	11.10		39.60	39.10	11.10	7007	57.40	14.70		34.20		3	31.50		40	5	23.90		23.90	6.10	23.90	6 10
KWh C SAVING PER YR	Y .			15, 122.30	4,027.80				0000	18,308.00		7 181 00	27 177 00					11,550.20		1,208.30			7 181 00	2 343 10	2.01					00 269 6	3,637.00 12,616.70				12,617.00			12 818 70	12,010.70		83,884.90		101,035.00		83,884.90	
KW SAVING PER YR	1																																				1						`			Ī
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SYSTEM EMCS NUMBER FUNC.	VOII DE	2	2	2	e (m (e (2	2	2	က	e .	2	2	2	2	2	2	က	က	m ·	-	-	12	12	12	12	6	o 0	on c	12	12	12	6	o (σ (o -	6 0	n c	2	2	2	2	2	2	, ,
SYSTEM	100	AHU2	AHU2	AHU2	AHU-3	AHU-3	AHU-3	AHU3	AHU3	AHU3	AHU-4	AHU-4	AH 14	AHU4	AHU4	AHU5	AHU5	AHU5	AHU-6	AHU-6	AHU-6	AHU6	AHUS	FIR-1	FTR-1	FTR-1	FTR-1	Ή	<u> </u>	Į į	E F	HTP4	HTP1	HTP2	HTP2	HTP2	HTP3	HTP3	2 3	ž ž	¥	HV2	HV2	H.22	£ 43	2 2
7				1		+																+	+																					+	+	\dagger
BLDG		ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	FNI PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	FN: PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP
BLDG	<u> </u>	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10550	10220	10570	10570	10570	10570	10570	10570	105/0	10570	10570	10570	10570	10570	10570	10570	10570	10570

TABLE E-2	SYSTEM SUMMARY LISTED BY BUILDING
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SIMPLE	0.2	26.6	0.2	22.2	NA	45.7	N/A	0.2	N/A	0.2	22.2	NA	22.2	0.2	N/A	0.2	45.7	0.2	NA	9.97	00.0	¥ 2	0.0	N/A	6.9	N/A	0.4	5.1	N/A	0.0	12.7	NA	0.2	0.1	N/A	12.7	12.7	N/A	0.2	NA C	7.07	211	N/A	0.2	0.2	N/A	43.3	0.2
<u></u>	52.0	0.3	44.5	0.4	N/A	0.2	NA	44.1	N/A	44.5	0.4	NA	0.4	44.5	Y.	44.1	0.2	44.4	N/A	0.3	1.0	7 0 0	14.2	X N	1.3	N/A	20.2	1.7	XX V	20.2	0.7	N/A	52.7	63.2	NA	0.7	0.7	N/A	52.7	N/A	0.3	70	N N	44.6	44.1	N/A	0.2	44.6
DISC. SAVING	39,331	120	26,884	144	512	20	512	26,608	512	26,884	144	512	144	26,884	512	26,608	0/	26,794	710	177	547	12 004	8.204	512	602	512	5,846	1,329	1 224	5 845	253	512	39,848	47,793	512	253	253	512	39,848	512	124	152	512	26.919	26,623	512	74	26,919
	756	363	604	363		363		604		604	363	1	363	604	1	604	363	604	200	363	203	200	576		472		289	773	773	289	363		756	756		363	363		756	000	363	363	3	604	604		363	904
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COST SAVING PER YR	4,641	14	3,171	16	8	∞ ;	9	3,140	99	3,171	16	99	15	3,1/1	09	3,140	200	13,161	8 3	<u> </u>	۰ چ	1 643	958	99	89	09	069	151	09	069	29	99	4,700	5,638	8	29	29	8	4,700	09	14	1,01	9	3,175	3,142	90	8	3,175
HOURS SAVING PER YR					က		3		3		•	e e		(ro				?		٤	,		3		3		•	2			3			3			3		3			3			3		
LPG SAVING PER YR																																																
F. OIL #2 SAVING PER YR				-											7																																	
District Htg SAVING PER YR	12.00	3.10	14.30	3.70	7	1.80		7.20		14.30	3.70	01.0	3.70	14.30	1 20	1.20	1.80	77.00	3.10	20.5	07:	4 80	60.70		15.50			34.20	34.50	2	6.50		25.30	25.30		6.50	6.50		25.30	50.0	12.60	390		15.20	7.60		1.90	15.20
	83,884.90		56,826.30				000	56,826.30	0	56,826.30			56 976 30	20,020.30	00 000 00	26,826.30	00 900 99	20,020,30				29 644 00	12,616.70				12,617.00			12,616,70			83,884.90	101,035.00					83,884.90		83 884 90			56,826.30	56,826.30			56,826.30
KW SAVING PER YR																																																
EMCS FUNC.					4 0	2	4 ,	-				4 6				- (_	٣			_	-	4	3		-		4 /	-		4	-					4		4 6			4	-	-		3	
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SYSTEM	HV4	HV4	MAU1	E SA	MAU1	MAUZ	MAUZ	MAUZ	MAU3	MAU3	MAU3	MAU4	MAIN	MALIA	COAM	MALIF	CONIN	MALIS	MAIR	MALIZ	MAU7	MAU7	HTP1	HTP1	HTP1	HTP2	HTP2	HTP2	HTP3	HTP3	¥	HZ1	ž	HZ2	¥	HYZ	¥	₹	£ 3	4	1 1	MAU1	MAU1	MAU1	MAU2	MAU2	MAU2	MAU3
BLDG DESCRIPTION	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAINT SHOP	VEH MAIN SHOP	VEH MAINI SHOP	VEH MAIN SHOP	VEH MAINI SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAIN SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	DES IMAINI SHOP	DOLO INIGINI HEAV	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP
BLDG NO.	10570	10570	10570	0/01	10570	105/0	0/501	10570	105/0	10570	105/0	105/0	2 2	103/0	102/0	0/201	0/0	10370	10570	10570	10570	10570	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10280	10580	10580	10580	10580	10580	10580	10580	10580

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	SIMPLE	7	VIV	0.0	K N	21.1	N/A	43.3	0.2	0.2	NA	25.7	N/A	63.3	0.4	6.5	0.5	N/A	1.5	34.3	Ν	N/A	1.0	92.3	2.4	N/A	0.2	1.6	N/A	N/A	1.0	Y.	1.0	1.6	1	N/A	ΑN	1.6	N/A	1.0	6.1	D.0	¥ +	NIA	10	6.1	N/A	1.0	6.1	N/A
	SIR PA	70	t S	44.6	A N	0.4	A/N	0.2	44.1	44.4	N/A	0.3	NA	0.1	23.1	1.4	17.0	N/A	5.7	0.3	ΝΑ	Ν	8.5	0.1	3.7	ΑN	41.3	5.4	N/A	N/A	8.9	N/A	8.9	5.4	¥ ¥	4.0 A/A	A N	5.4	N/A	8.6	1.5	C.L	ξ α	O'O	86	1.5	N/A	8.6	1.5	ΑN
TOTAL \$	DISC.	157	542	26.919	512	152	512	74	26,623	26,818	512	124	512	51	13,932	493	10,283	512	3,428	83	512	512	2,469	74	1,756	512	23,773	2,359	512	512	3,232	512	3,232	2,359	2350	512	512	2,359	512	5,193	528	528	5 103	513	5 193	528	512	5,193	528	512
TOTAL BLDG.	yaya kaya s	363	3	604		363		363	604	604		363		363	604	363	604		604	363			289	773	472		929	433			383		383	433	400	55		433		604	363	363	709	3	604	363		604	363	
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	SAVING PER YR																																																	\dashv
ABE Pa	SAVING PER YR																														-										-	_								
MBtu F. OIL #2	SAVING PER YR																																																	
MBtu District Htg	SAVING PER YR	6	3	15.20		3.90		1.90	7.60	12.60		3.20		1.30	5.10	12.70	163.30		31.10	2.40				1.90	45.20		583.30				83.20		83.20							113.60	13.60	13.60	113 60	2	113.60	13.60		113.60	13.60	
K.	SAVING PER YR			56 876 30					56,826.30	56,826.30					29,644.00		8,501.70		4,791.40				5,328.60				2,397.80	5,092.00						5,092.00	00 000	0,780,0		5,092.00		1,683.30			1 683 30	00.000.1	1.683.30	3		1,683.00		
₹	SAVING PER YR																																																	
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	SYSTEM EMCS NUMBER FUNC.	-		-	-	-		_	-	_	_	-	_		*-	-	_	1	1	*-	_	6	တ	σ	12	12	12	14	14					14	4 4	14	14	14	1	-				- -				-		12
	SYSTEM	MALIS	MALIA	MAU4	MAU4	MAU4	MAUS	MAUS	MAUS	MAUG	MAU6	MAUG	MAU7	MAU7	MAU7	AHU1	AHU1	AHU1	AHU2	AHU2	AH02	里	Ή	퓌	HE2-PER	HE2-PER	HE2-PER	AHU-1	AHU-1	AHU-10	AHU-10	AHU-11	AHD-11	AHU-2	AHU-2	AHIL3	AHD-4	AHU-4	AHU-6	AHU-6	AHU-6	AHU-7	AHU-/		AHI-8	AHU-8	AHU-9	AHU-9	AHU-9	HE-1
																												SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL.	SUPPL	SUPPL	S SUPPL	SUPPL	SUPPL	SUPPL S	SUPPL	SUPPL	SUPPL	SUPPL	1 00 10 X	SUPPL	SUPPL	SUPPL	S SUPPL	S SUPPL	SUPPL
	BLDG DESCRIPTION	GOLIO TINIAM LICIV	DUCTO INVINITION	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	ENL BK W/O DIN + ADM & SUPPL	BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPI	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	EN BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BY W/O DIN + ADM & SUFFL	ENL BK W/O DIN + ADM & SUPPL	EN BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL
	BLDG NO.	00000	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10580	10610	10610	10610	10610	10610	10610	10610	10610	10610	10610	10610	10610	10612 ENL	10612 ENL	10612 ENL						10612 ENL								10012 ENE	10612 ENL			10612 ENL		

	SIMPLE		40.1	10.4	Y/N	1 1	N/A	7.5	-	7.5	NA	7.5	1.1	N/A	1.0	N/A	1.0	NA	60.4	N/A	18.4	35.8	N/A	6.1	N/A	0.5	N/A	31.7	1.5	1.0	92.3	N/A	7.0	2.0	N/A	1.6	N/A	1.0	1.0	N/A	1.6	N/A	1.6	N/A	1.6	NA	1.0	6.1	NA L	N/A
	a. a.	3	0.2	0 5	X X	7.9	A N	1.2	7.9	12	N A A	1.2	7.9	N/A	8.5	ΝΑ	8.5	N/A	0.1	N/A	0.5	0.2	N/A	1.4	N/A	17.7	N/A	0.3	5.8	8.5	0.1	A C	7.7	2 4	Q A	5.4	Ν	8.8	8.8	N/A	5.4	N/A	5.4	ΑN	5.4	K N	8.5	1.4	A G	S &
TOTAL \$	DISC. SAVING	9,7	04	200	512	4.786	512	427	4.786	427	512	427	4,786	512	3,089	512	3,089	512	113	512	133	190	512	521	512	10,680	512	101	3,502	2,469	74	212	101,04	1 865	512	2.359	512	3,182	3,182	512	2,359	512	2,359	512	2,359	512	5,124	521	5 124	512
TOTAL BLDG.	INST. COST	77.7	200	607		604		363	604	363		363	604		363		363		773		289	773		363		604		363	604	289	773	273	0/0	472	1	433		363	363		433		433		433		604	363	604	5
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MBtu LPG	SAVING PER YR																																																	
MBtu F. OIL #2	SAVING PER YR									-															٠																									
MBtu District Htg	SAVING PER YR	Carc	200	7 30	3	103.10		11.00	103.10	11.00		11.00	103.10		79.50		79.50		2.90			4.90		13.40		173.50		2.60	33.00		1.90	610.60	20.25	48 00				81.90	81.90								111.80	13.40	111.80	
- i.	SAVING PER YR		287 50			1,683.30			1,683.30				1,683.30								287.50					8,501.70			4,791.40	5,328.60		2 307 80	3			5,092.00					5,092.00		5,092.00		5,092.00		1,683.30		1.683.30	
¥	SAVING PER YR	5.0																																																
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	SYSTEM EMCS NUMBER FUNC.	o	ο	5	6	-	-	1	-	-	•	,	-			-	*-	-	6	6	6	6	6	-			-		-	6	6	2 6				14	1	_	_	-	14	14	14	14	14	14	-		- -	-
	SYSTEM	-	ij	¥	里 上	AHU-1	AHU-1	AHU-1	AHU-2	AHU-2	AHU-2	AHU-4	4-UHA	AHU-4	AHU-5	AHU-5	AHU-6	AHU-6	H-1	표-1	H-1	HE-2	HE-2	AH01	AHU1	AHU1	AH02	AHU2	AH02	Ŧ.		HE) DED	HE2, DEP	HF2-PER	AHU-1	AHU-1	AHU-10	AHU-10	AHU-11	AHU-11	AHU-2	AHU-2	AHU-3	AHU-3	AHU-4	AHD-4	AHU-6	AHU-6	AHU-7	AHU-7
	BLDG DESCRIPTION	Iddi io o May - Mid Charyid iidi	ENL BY W/O DIN + ADM & SLIPPI	ENC BY W/O DIN + ADM & Stippi	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL			ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL		ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL		ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL		BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG			BN HQ BLDG		BN HQ BLUG			ENE BK W			ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL		ENL BK W/O DIN + ADM &				ENL BK W/O DIN + ADM & SUPPL		ENL BK W/O DIN + ADM & SUPPL FNI BK W/O DIN + ADM & SLIPPI	
	BLDG NO.	7,004										10614	10614	10614	10614	10614	10614	10614	10614	10614	10614	10614		10620	10620	10620	10620	10620	10620	10620	10620	10620	10620	10620	10622	10622		10622	10622	10622	10622		10622			10622	10622		10622	10622

	SIMPLE		6.1	6.1	1.0	W.	Z/V	0.5	0.1	18.4	Y/N	W.	46.1	0.5	6.4	A'N	N/A	1.6	37.4	1.0	N/A	92.3	ΝA	0.2	2.4	¥.	1.6	N/A	1.0	0.0	Z Z	1.6	1.6	N/A	Ϋ́	1.6	Z.	1.1	5.0	0.0	1	6.3	-	N/A	N/A	6.3		46.1	N/A
	SIR N		1.4	1.4	8.5	Y S	Z 2	0.0	4.1	0.5	N/A	N/A	0.2 N/A	17.2	1.4	N/A	V/N	5.5	0.2	8.5	N/A	0.1	N/A	41.3	3.7	N/A	5.4	Α N	8.0	0 2	S S	5.4	5.4	N/A	V/A	5.4	K/Z	χ. Υ. τ	4.	4.14	X C	6.5	8.3	ΑN	N/A	1.4	8.3	0.2	¥ X
TOTAL *	DISC. SAVING	1	175	175	5,124	210	5 173	0, 123	176	133	710	512	787	10.404	504	512	512	3,308	85	2,469	512	74	512	23,773	1,756	512	2,359	512	3,232	3,232	512	2,359	2,359	512	512	2,359	710	570,5	200	543	217	509	5,023	512	512	209	5,022	148	512
	INST.		203	303	604	1	809	5 6	202	289		c.	(//3	604	363			604	363	289		773		576	472		433		363	303		433	433			433	100	504 804	200	263	3	363	604			363	604	773	
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HOURS	SAVING PER YR				°	2 6	2			·	2 (20				3	3				3		3			3		က		~	9 6			3	9	C	0				2			3	က				3
MBtu LPG	SAVING PER YR																																																
MBtu F. OIL #2	SAVING PER YR																																																
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17.3	SAVING PER YR			000 000	1,003.30		1 683 00	200,1	707	UC. 182				8,501.70				4,791.40		5,328.60				2,397.60			5,092.00					5,092.00	5,092.00		000	5,092.00	4 600 00	1,003.30			1 503 30	200.500	1,683.30				1,683.00		
×	SAVING PER YR																																																
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	SYSTEM	71014)-DLY	AHOO	AHC-0		9-11-4		8-0E4		֓֞֜֜֜֜֜֜֜֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓		<u> </u>	AHU	AHU1	AHU1	AHU2	AHU2	AHU2	Ή	Ή	里	HE2-PER	HE2-PER	HE2-PER	AHU-1	AHU-1	AHU-10	AHU-10	AHIL11	AHU-2	AHU-2	AHU-3	AHU-3	AHU-4	AHU-4	P C	AHC-P	AHC-9	AHO-1	2 2	AHU-8	AHU-8	AHU-8	AHU-9	AHU-9	AHU-9		HE-1
		2	SUPPL	2000	SUPPL	מונים ומינים	Jadi IS	וממוט	SUPPL SUPPL	SUPPL	OULL TO	SUPPL	SUPPL	3												SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	2007	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL	SUPPL
	BLDG DESCRIPTION	0 100	ENL BK W/O DIN + ADM & SUFFICE	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENE BR VV/O DIN + ADM & SUFPL	ENL BK W/O DIN + ADM & SI IPPI	S MON + MON ON	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPLENI BK W/O DIN + ADM & SUPPL	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENI, BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + AUM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	WO DIN + ADIM &	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	10632 ENL BK W/O DIN + ADM & SUPPL 10632 ENL BK W/O DIN + ADM & SUPPL
			ENL BK W	ENL BK V	EN BK W	ENL BY W			ENL BK V	ENL BK W	FINE BY V	ENL BK W	ENL BK W	i															ENL BK V																	ENL BK V	ENL BK V	ENL BK V	ENL BK V
	BLDG NO.	0000,					10622		77901				10622		10630	10630	10630	10630	10630	10630	10630	10630	10630	10630	10630	10632	10632	10632	10632	10637	10632	10632	10632	10632	10632	10632	10632	10632	10632	10632	75001	10632	10632	10632	10632	10632	10632	10632	10632

SIMPLE	PAYBACK	18.4	N/A	0.5	N/A	6.5	34.3	C.L	N/A	A/V	10	0.0	20	N/A	7.6	N/A	1	A/N	7.6	1.	7.6	-	N/A	N/A	-	-	X X	18.4	N/A	60.4	35.8	Y S	Y Y	5.	0. I	-	8	8.1	13	NA	N/A	=	1-	Ν	18.4	ΝΑ	60.4	N/A	35.8	Z X
Taranga da	<u> </u>	0.5	N/A	17.0	Ψ,	4 0	5.0	7.0	¥ S	7 -	יני מ	413	3.7	₹ Z	12	N/A	7.8	¥ N	1.2	7.8	1.2	7.8	ΑN	Α×	8.4	8.4	¥.	0.5	N/A	0.1	0.2	Y.Y	Z Z	0 7	- N	6.7	+-	=	6.7	AN	N/A	7.8	7.8	N/A	0.5	N/A	0.1	A/N	0.2 N/A	N/A
S S DISC.	SAVING	133	512	10,283	512	5 63	2 470	3,420	212	74	2 469	23.773	1 756	512	423	512	4,719	512	423	4,719	423	4,719	512	512	3.038	3,038	512	133	512	113	190	212	710	200,	512	4 063	392	392	4.063	512	512	2,836	2,836	512	133	512	113	512	190	710
TOTAL BLDG. INST.		289		604	262	202	202	3		773	289	576	472		363		604		363	604	363	604			363	363		289		773	773		763	263	3	804	363	363	604	- 	_	363	363		588		773	-	773	_
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LABOR HOURS SAVING PER YR	í		9	c	7			3	0 60			i		3		3		3					3	3			3		3		0	7 6	,		3					3	3			3		3	-	e	3	,
MBtu LPG SAVING PER YR																																																		
MBtu F. OIL #2 SAVING PER YR																																																		
MBtu District Htg SAVING PER YR			162 20	200.00	12.70	2.40	31.10			1.90		583.30	45.20		10.90		101.40		10.90	101.40	10.90	101.40			78.20	78.20				2.90	DS.4		84.50	10.10		84.50	10.10	10.10	84.50			73.00	73.00				2.90	4 90	70.	
KWh SAVING PER YR		787.50	8 504 70	2			4,791.40				5,328.60	2,397.80					1,683.30			1,683.30		1,683.30						287.50					1,683,30			1,683.30			1,683.30						287.50			1		
KW SAVING PER YR																							Ì								Ī																			
SYSTEM EMCS NUMBER FUNC.			D -	1		1 3	1	1	9		6		12 3		1 3														20 0	0 0			ļ	1 3	1 4	1 1		1 3										9 0		
SYSTEM NAME		<u> </u>	AH 14	AH 1	AHU1	AHU2	AHU2	AHU2	Ή	Ή	Ë	HE2-PER	HE2-PER	HE2-PER	AHU-1	AHC-1	AHC-1	AHU-2	AHU-2	AHU-2	AHU-4	AHU-4	AHU-4	AHU-5	AHU-5	AHU-6	AHU-6	Į.	<u> </u>	1 1	122	AHU-1	AHU-1	AHU-1	AHU-2	AHU-2	AHU-2	AHU-4	AHU-4	AHU-4	AHU-5	AHU-5	AHU-6	AHU-6	Ÿ	보 :	¥ 5	7 1 1 1 1 1	AHU1	
BLDG DESCRIPTION		ENL BK W/O DIN + ADM & SUPPL						BN HQ BLDG	BN HQ BLDG		BN HQ BLDG	BN HQ BLDG	BN HQ BLDG	BN HQ BLDG		ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL						ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL			ENL BA W/O DIN + ADM & SUPPLENI BK W/O DIN + ADM & SI IDDI		ENL BK W/O DIN + ADM & SUPPL	ENIL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL	ENL BK W/O DIN + ADM & SUPPL		ENL BK W/O DIN + ADM &	ENL BK W/O DIN + ADM & SUPPL			
BLDG NO.		10637	10640	10640	10640	10640	10640	10640	10640	10640	10640	10640	10640	10640	10642	10642	10642	10642	10642	10642	10642	10642	10642	10642	10642	10642	10642	10642	10042	10642	10642	10644	10644	10644	10644	10644	10644	10644	10644	10644	10644	10644	10644	10644	10644	10644	10644	10644	10650	

TABLE E-2 SYSTEM SUMMARY LISTED BY

SIMPLE		1.3	0.4		0.4	¥ 2	0.4	Ψ/N	1.3	2.5	2 0	O A	0.7	1.9	12.1	1.3	N/A	NA	ΑΝ	15.8	0.5	4.5	0.5	A/A	0.4	ς .	K C	י ע	N/A	0.2	N/A	8.3	8.3	A C	N A	0.2	8.3	N/A	0.2	16.5	0.2	13.7	NA	0.2	27.4	NA	N/A	13.7	0.2
<u>∝</u> ≅		6.7	21.0	7.8	19.6	A/V.	20.3	K/N	6.8	21.2 VIV	11 2	Z X	13.1	4.6	0.7	6.7	N/A	N/A	N/A	9.0	17.6	2.0	16.4	N/A	20.2	-	Z 20.	1.02	Y X	53.4	N/A	1.1	1.	A/N	N/A	53.4	-	ΑN	52.4	0.5	45.1	9.0	N/A	44.3	0.3	A'N	A S	0.6	45.1
TOTAL \$ DISC. SAVING		2,448	12,707	2,817	14,808	15 367	100.00	71.0	23 606	512	3.978	512	9,940	1,659	264	4,062	512	512	1,228	431	5,081	925	9,470	212	5,846	625,1	212	1 224	512	40,376	512	385	382	212	512	40.376	385	512	39,618	194	27,233	233	512	26,783	117	512	512	233	27,233
TOTAL BLDG. INST. COST		363	604	383	756	756	3	8	363	200	363	3	756	363	363	604				773	289	472	2/6	0	289	(/3	280	207	2	756		363	363	756	8	756	363		756	363	604	363		604	363		000	363	604
A POINT		-	-	-		-	1	1			-		+	-	1	-				2		-	2		(7		,	7	-		-	-	Ť		-	-		-	-	1	1		-	-	1	1	- ,	-
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8 8						_			•				-			_									_		-			-		-		•		-			-		1			-				(0)	_
COST SAVING PER YR		278	1,469	320	1,713	1 783	3 8	2 2	787	2,72	452	9	1,153	188	30	476	99	90	139	49	284	105	1,102	3 8	069	เกีย	200	130	8	4,760	90	44	44	909 4	090,0	4 760	44	99	4,674	22	3,211	26	99	3,160	13	8 8	9	26	3,211
LABOR HOURS SAVING PER YR					~	?		2		~)	3			-		3	3				-	(2		c	2		6		3		,	5	6)		9					3			0	9		
MBTu LPG SAVING PER YR																																																	
MBtu F. OIL #2 SAVING PER YR		•																																															
MBTU District Htg SAVING PER YR		63.00	174.40	72.50	200.80	177.20	24:11	0.70	283.50	20.007	102.40	i	118.10	42.70	6.80	18.90			31.60	11.10	87.40	23.80	93.30		04.00	34.20		31 50	2	38.90		9.90	9.90	38 00	30.30	38.90	06.6		19.40	5.00	23.30	00.9		11.70	3.00		8	6.00	23.30
KWA C SAVING PER YR			12,801.70		15,122.30	18 308 00	20.00		27 177 00	20:111			11,550.20			7,181.90					3,637.00		12,617.00	00 270 07	12,617.00		12 616 70	2,00.7		83,884.90				404 035 00	00.000	83.884.90			83,884.90		56,826.30			56,826.30				00000	56,826.30
KW SAVING PER YR																																																	
EMCS FUNC.		3	-	3	- 4	-		1 (0 -	- 4	r e		-	3	3	-	4			7					- 1		4 4			٦	4	3		4 +						3	1	3	4						_
SYSTEM EMCS NUMBER FUNG.				2	2 2	1	1 (7 (7 6	10	2 2	2 2	2	2	1	,-		6	6	6	6	12	12	71	5 0	ח מ	n 0	0	0	2	2	2	2 2	7 (2 0	,	2	2	2	2	-	-	-					-	_
SYSTEM		AHC1	AHU1	AH02	AHU2	20H0	2 2	2012	AHUS	AH IA	AHU4	AHUS	AHUS	AHU5	AHU6	AHU6	AHU6	五	Ŧ	H	Ή	HTP1	HIP		HTP2	24 2	HTP2	E E	HTP3	H	HV1	HV1	HV2	242	EXH	S S	E¥3	HV4	HV4	HV4	MAU1	MAU1	MAU1	MAU2	MAU2	MAUZ	MAU3	MAU3	MAU3
BLDG		ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	NIC TENS	EINL PERS DIN	ENL PERS DIN	ENC PERSONN	ENE PERSON	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	ENL PERS DIN	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAIN! SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP
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8 D3	•	10650	10650	10650	10650	10000	0000	DC9DL	10650	10000	10650	10650	10650	10650	10650	10650	10650	10650	10650	10650	10650	10660	10660	10660	10660	10660	10660	10000	10660	10660	10660	10660	10660	10660	10680	10660	10660	10660	10660	10660	10660	10660	10660	10660	10660	10660	10660	10660	10660

TABLE E-2	SYSTEM SUMMARY LISTED BY BUILDING	
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FOTAL \$ DISC. SIMP SAVING SIR PAYBA	512 N/A N/A			0.2	N/A	0.7	16.5	NA	0.4	N/A	41.2	N/A	0.0	NA A	5.1	0.4	N/A	5.6	0.4	Z Z	7.0 8.0	X X	8.0	0.1	0.2	8.0	16.1	0.2	ΑN	13.3	0.2	¥ c	26.6	N/A	13.3	Ϋ́	0.2	13.3	2 0	2.0	N N	0.2	¥ N	16.1
TOTAL \$ DISC. SAVING SIR		5.1	<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>		1	1																															- [
SAVI	12	4	9.6	44.3	¥ c	44.8	0.5	N N	23.2	N/A	0.5	Y Z	20.0	S &	1.7	20.2	N/A	1.6	20.2	A/A	1.50	AN N	1.1	64.0	53.5	- 5	0.5	52.4	Ν	0.7	45.1	¥ ×	0.3	N/A	0.7	N/A	45.1	0.7	45.4	3 6	S X	44.4	Ψ.X	0.5
	ú	27,233	233	20,783	512	27 082	194	512	14,037	512	78	512	3,002	512	1,329	5,846	512	1,224	5,845	212	40,430	512	400	48,376	40,430	400	198	39,646	512	241	27,268	512	120	512	241	512	27,268	241	21.0	120	512	26,798	512	198
BLDG. INST. COST		604	363	6U4	363	604	363		604		363	973	070	7117	773	289		773	289	756	363	2	363	756	756	363	363	756		363	604	708	363		363		604	363	804	363	3	604		363
POINT		-	-		T	-	-		1		-	,	7 +		2			2		1			-	-	-	-	-	-		-	-	-	-		1		-		7	-	-	1		
DI		-	•			-			1			•	-			1			-	C	7			2	2			2			-	•	-				-		•	-		-		
AO POINT		-		-	1	-	-		-		-		*		+			-		-	-		1	-	-	-	-	-		-		1	-		1		-	-	•			1		-
DO		-	•	-		7			1			•				*			-	-				-	-			1			-	•							•	-		-		ľ
COST SAVING PER YR	90	3,211	26	3,160	9 5	3.194	22	9	1,656	90	o	1 1 1 1 7 7	400	8	151	069	9	139	069	00 7.66	45	9	45	5,704	4,766	45	22	4,677	9	27	3,215	3 167	14	9	27	9	3,215	27	2 245	0,410	9	3,162	09	22
HOURS SAVING PER YR	3			•	n			3		3		3		3			က		,	0		3				٣	2		3			3		3		က		ſ	9		6		3	
LPG SAVING PER YR																																												
F. OIL #2 SAVING PER YR																	-	į																										
MEM District Htg SAVING PER YR		23.30	6.00	11.70	3.00	19.40	5.00		7.80		2.00	02 30	24.70		34.20			31.50		40 30	10.30		10.30	40.30	40.30	10.30	5.10	20.10		6.20	24.20	12.10	3.10		6.20		24.20	6.20	00.70	3.10	5.0	12.10		5.10
KWh SAVING PER YR		56,826.30	00 300 39	20,020.30		56,826.30			29,644.00			12 616 70	2,010,71			12,617.00			12,616.70	83 884 90	00,004			101,035.00	83,884.90			83,884.90			56,826.30	56 826 30	20.020,00				56,826.30		56 976 30	20,020.30		56,826.30		56 876 30
KW SAVING PER YR																																												
EMCS FUNC.	4	-	m +	- \	4 6	, -	3	4	-	4	ω.	4 +				-	4			4 4		_		1		8 2			4			4 -	3	4	3	4			4 4			1		6 -
SYSTEM EMCS NUMBER FUNC.						-	-	1	-	_	- !	12	1 2	6	6	6	6	6	0 0	7 6	2 2	2	2	2	2	2 2	2 2	2	2		-			-	1	-			- -			1		
SYSTEM	MAU4	MAU4	MAU4	MACO	MAUS	MAUG	MAU6	MAUG	MAU7	MAU7	MAU7	H P1	1	HTP2	HTP2	HTP2	нтРз	HTP3	HTP3		ž	HV2	HV2	HV2	H	£ 5	¥4	¥	HV4	MAU1	MAU1	MAU1	MAU2	MAU2	MAU3	MAU3	MAU3	MAU4	A S	MAIR	MAUS	MAUS	MAU6	MAUG
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DG IPTION	STOF	ST STOR				S S S S S S S S S S S S S S S S S S S	N SHOR	NT SHOF	NT SHOF	NT SHOF	NT SHOP	OHS IN	OHO IN	NT SHO	NT SHO	NT SHOF	NT SHOP	NT SHOP	OHO LN	STOLIN FIN	NT SHO	NT SHO	NT SHO	NT SHOP	NT SHO	N SHO	NTSHO	NT SHO	NT SHO	NT SHO	NT SHO	N SHO	OHS IN	NT SHO	NT SHO	NT SHOI	NT SHO	NT SHO		OLO LA	OHS IN	NT SHO	NT SHO	N SHO
BLDG	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAIN SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP
BLDG NO.	10660	10660	10660	10660	10660	10660	10660	10660	10660	10660	10660	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	10670	0/90	10070	10670	10670	10670	10670

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SIMPLE	0.4	N/A	39.2	NA	4.8	0.5	N/A	5.1	0.0	A/N	5.6	8.8	N/A	0.2	8.8	N/A	0.1	N/A	8.8	0.2	17.5	0.2	N/A	0.2	14.7	N/A	N/A	29.4	N/A	14.7	0.2	0.2	NA	14.7	29.4	0.7	A/N	0.71	7.0	43.3	N/A	0.4	N/A	2.2	2.2	AN C	2.2
<u>.</u>	23.3	¥ N	0.2	A/N	1.9	16.1	Y.	17	20.2	ZO.Z	1.6	1.0	N/A	53.3	1.0	N/A	63.8	N/A	1.0	53.3	0.5	52.4	A/A	0.0	9.5	44.9	Z V	0.3	ΑN	9.0	45.0	45.0	N/A	9.0	0.3	44.3	¥ 1	0.0	44.8	Z C	Z X	23.2	ΑN	3.9	3.9	¥ C	3.9
DISC.	14 049	512	82	512	874	9,272	512	1,329	5,846	512	1,224	365	512	40,291	365	512	48,236	512	365	40,291	183	39,580	512	27,183	218	21.5	513	109	512	218	27,183	27,183	512	218	109	90/97	71.0	103	27,043	710	512	14,018	512	2,361	2,361	512	2,361
BLDG. INST. COST	604		363		472	576		773	587	503	773	363		756	363		756		363	756	363	756	100	604	202	804	3	363		363	604	604		363	363	₽Q4	8	202	904	363	3	604		604	604		904
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COST SAVING PER YR	1 657	99	6	9	66	1,079	20 1	151	060	09	139	41	09	4,750	41	09	5,688	8	41	4,750	21	4,670	90.0	3,205	2 2	3 157	6	12	09	25	3,205	3,205	8	25	172	3,73/	8 8	17 6	08. to	8 «	09	1,654	09	279	279	8 6	279
HOURS SAVING PER YR		3		3			5			m			3			3		3					5		6	2	۳.	,	3				3			6	7			2	6		8			6	٣
LPG SAVING PER YR																																															
F. OIL #2 SAVING PER YR						-												1																													
District Htg SAVING PER YR	8.10		2.10		22.50	88.20	0.400	34.20			31.50	9.40		36.70	9.40		36.70		9.40	36.70	4.70	18.40	00.00	22.00	00.0	11 00		2.80		5.60	22.00	22.00		5.60	71.00	1.00	4.70	4 4.70	0.40	1.90		7.30					
KWh SAVING PER YR	29.644.00					12,616.70		42 647 00	12 616 70	2.00				83,884.90			101,035.00			83,884.90	00,00	83,884.90	76 900 92	20,620.30		56 876 30	200				56,826.30	56,826.30			26 976 90	20,620.30		56 878 30	20,020,30			29,644.00		5,095.10	5,095.10	07 100 1	5,095.10
KW SAVING PER YR																																															
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SYSTEM EMCS NUMBER FUNC.		-	-	12	12	12	ס כ	n c	n o	0	6	2	2	2	2	2	2	2	2	2	2	7	7	-		-	-	-	-	1	-	•	-		- -		-	-	- +	-	-	-	3	3	3	6	3
SYSTEM	MAU7	MAU7	MAU7	HTP1	HTP1	HTP1	7414	2414	HTP3	HTP3	НТРЗ	H71	₹	¥	HV2	HV2	HV2	£	HV3	£	¥ .	HV4	T VA	MAC	MALI	MALIZ	MAU2	MAU2	MAU3	MAU3	MAU3	MAU4	MAU4	MAU4	COAM	SUAM Si IAM	SOLAN STANK	NAL IA	MACO	MAI 17	MAU7	MAU7	AC-1	AC-1	AC-3	AC-3	AC-5
BLDG DESCRIPTION	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINI SHOP	VEH MAINI SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAIN! SHOP	VEH MAINT SHOP	TOUR TAIL	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	VEH MAINT SHOP	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING
B	VEH W	VEH M	VEH M	VEH M	VEH W	VEH W	VEH W	VEH M	W HHA	VEH W	VEH M	VEH M	VEH M,	VEH M,	VEH M,	VEH M,	VEH M.	VEH M.	VEH M	VEH M	VEH M	VEH M.	N H	VEH W	V 10	VEH M	VEH M	VEH M.	VEH M	VEH M.	VEH M.	VEH M.	VEH M.	VEH	VEH	M HIN		אַ בער אַ אַר	N 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	N HHA	VEH M	VEH M	ADP	ADP	ADP	ADP	A C
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No.	10670	10670	10670	10680	10680	10680	10680	10680	10690	10680	10680	10680	10680	10680	10680	10680	10680	10680	10680	10680	10680	10680	10680	10680	10000	10680	10680	10680	10680	10680	10680	10680	10680	10680	200	10680	3 3	10000	10690	10680	10680	10680	10690	10690	10690	10690	10690

SYSTEM SUMMARY LISTED BY BUILDING

ŭ Ž	PAYBACK	3.2	Ν	3.2	NA	1.3	NA	N/A	1.2	0.1	X X	N/A	4 4	Z Z		2	2	3.4	-	N/A	0.2	N/A	39.8	N/A	103.1	Ν	44.6	3.8	NA Y	28.8	Y.V	N/A	4.1	NA	1.6	0.7	N/A	71.0	NA	×	0.5	28.3	32.6	N/A	0.1	N S	N/A	5.5
	SIR AP	2.7	N/A	2.7	N/A	6.3	ΑN	ΝΆ	7.3	105.4	N/A	N/A	A/V	¥ 4/4			2 3	2.5	8.4	N/A	40.9	ΑN	0.2	N/A	0.1	N/A	0.2	2.3	₹ c	. 0	N/A	N/A	2.2	ΑΝ	5.4	64.3	7.1 V/V		N/A	V N	16.6	0.3	0.3	N/A	206	A S	A/V	1.7
TOTAL S Disc	SAVING	1.607	512	1,607	512	3,797	512	512	3,885	61,548	512	112	210	14.	202	24.5	7100	948	3.054	512	24.684	512	171	512	99	512	8	839	512	163	512	512	789	512	1,970	38,639	104	1 5	276	512	9,544	241	75	512	54,786	885	512	9,444
BLDG.		604		604		604			534	584							700	90 65	363		604		773		773		472	363	784	534	3		363		383	604	202	777	7/4		576	773	289		604	T	100	534
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HOURS			3		3		3	3			3	C	2	8]	"	1			3		3		3		3			e		3	3		3			6			8				3			5	
LPG SAVING	PER YR																																															
F. OIL #2	PERYR																																															
MBIU District Htg SAVING	PER YR								100.00	687.20							160 40	24 40	78.60		538.70		4.40		1.70		2.40	21.60		4 20	1		20.30		50.70	315.60	20.	2 60	7.10		46.70	6.20			198.00		08 00	1.60
KWIN I	PER YR	3,468.10		3,468.10		8,195.20	-			71,785.00		242.10	303.80	202.00	107 201	02.101	4 500 70	4,300.70			8,103.00														3	57,364.40					16,683.90		162.00		101,645.30	1,911.20	49 640 00	1,734.00
KW	PER YR									27.1																			9	S																		
EMCS	FUNC.	-	4	-	4	1	4			-			t (- 6				4	7		7				4 -				3	4			0 4					7	1	9 4	3 1		4 0	3 6
SYSTEM	NUMBER FUNC.	3	3	3	3	3	3	4	4	4	=	7 7	= =	7		-	•					6	0	6	0	12	12			1 4	4		-			-		. ;	12	12	12	5,	6					
SYSTEM	NAME	AC-7	AC-7	AC-8	AC-8	AC-9	AC-9	AHU-1	AHU-1	AHU-1	S-5-	CG-1	3 2	3 2	3 2	? }	- 1	- N	K-7H	HV-2	HV-2	HX-1	HX-1	?	۲ .	FTR	FTR	¥-1	¥.	ACI I-1	ACU-1	HWU-1	HVU-1	HVU-2	HWU-2	HV0-3	HVU-3	2	-X-X	X Y	H . -X	HX-2	HX-2	HX-2	AHU-1	AHU-1	AHU-1	AHU-10
																																			Ì				T						H MAIN	H MAIN	MAIN	MAIN
	DESCRIPTION	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BILLING	ADP BUILDING	ADP BUILDING	ADP BUILDING	ADP BUILDING	FIRE STATION	FIRE STATION	FIRE STATION	FIRE STATION	FIRE STATION	FIRE STATION	POST SAFETY// FA	POST SAFETY/LEA	POST SAFETY/LEA	POST SAFETY/LEA	POST SAFETY/LEA	POST SAFETY/LEA	POST SAFETY/LEA	POST SAFETY/LEA	DOET CAFFTY EA	POST SAFETY// EA	POST SAFETY/LEA	POST SAFETY/LEA	POST SAFETY/LEA	POST SAFETY/LEA	POST SAFETY/LEA	CLO SALES STORE & EXCH MAIN	10730 CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	10/30 CLO SALES STORE & EXCH MAIN
č	<u>8</u>	10690	10690	10690	10690	10690	10690	10690	10690	10690	10690	10690	10690	10690	10090	0000	08901	10690	10690	10690	10690	10690	10690	10710	10710	10710	10710	10710	10710	107 15	10715	10715	10715	10715	10715	10715	10/15	107.15	10715	10715	10715	10715	10715	10715	10730 CLO	10730 CLO	10730 CLO	10/30 CLC

SIMPLE	N/A	1.0	N/A	N/A	0.3	1.2	A N	9.0	N/A	2.4	N/A	0.3	1.3	N/A	N/A	0.2	1.1	N/A	N/A	5.8	N/A	0.9	NA	1.4	N/A	9.8	N/A	2.0	0.4	N/A	¥ :	Y Z	2.6	0.0	Z VIV	0.1	N/A	Α'N	0.4	Α.Χ	4.6	4.6	N/A	0.5	N/A	1.9	38.7	0.6	0.2 NA
SIR	NA	8.3	N/A	Ν	33.5	7.2	Ϋ́	14.7	N/A	3.6	N/A	27.4	6.5	NA	NA	39.4	7.5	N/A	N/A	1.5	N/A	9.5	ΑN	0.9	N/A	6.0	ΑN	4.2	22.7	Ψ.	¥ :	X C	5 5	2.0	VIV	75.8	AN N	×	24.8	¥	1.8	1.8	N/A	18.6	ΝA	4.6	0.2	15.4	41.9 X
TOTAL \$ DISC. SAVING	82	5,010	512	357	20,259	3,870	512	8,873	183	1,917	342	16,566	3,478	512	512	23,787	4,019	389	9/	9//	512	5,528	46	3,623	512	462	512	2,259	13,716	210	512	200	1,766	512	512	43.686	602	512	11.698	512	531	531	512	10,887	512	2,459	142	5,583	25,296
TOTAL BLDG. INST. COST (604			604	534		604		534		604	534			604	534			534		604		604		534		534	604			i	200	50		576			472		289	289		584		534	647	383	604
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POINT POINT		-			-			-				-				-						-		1									•			-					-	-		2					-
OA OINT		-				2				2			2			-	2			2		1		1		2		2	-			ſ	7						_					ŀ		2	- '		
8 Polint		1		_	-					15						-	-		_			1			_				-				`			-				_	-	-		-					
COST SAVING PER YR	9	589	8	42	2,376	455	90	1,046	22	226	9	1,951	410	8	9	2,805	473	46	6	92	09	651	5	427	9	54	8	266	1,613	25	9 5	200	1 150	60	8 6	5,001	89	99	1,328	8	63	63	90	1,233	99	277	17	634	2,889
LABOR HOURS SAVING PER YR		9	3			1	3							က	3						3				3		3			(9			3	· c			3		9			3		3		1		9
MBtu LPG SAVING PER YR																																												72.10		18.70			
MBtu F. OIL #2 SAVING PER YR																																																	
MBtu District Htg SAVING PER YR		12.10			87.30	10.00		10.10	!	3.40		29.50	3.60			17.20	5.80			0.80		10.90		5.50		0.40		5.30	38.10			E 30	35.70	3		886.00	15.50		301.10								140.70	143.70	D1.7cc
KWh SAVING PER YR	177.80	7,589.50		//0.40	36,406.90	7,513.80		18,303,80	395, 10	3,853.30	738.80	33,282.70	7,205.60			49,899.00	8,188.20	839.50	164.90	1,608.70		11,017.10	98.80	7,358.70		963.30		4,431.20	26,410.00	454.30	345.20	02.CFC	18 316 70	2		19,993.90					1,031.50	1,031.50		14,534.40		2,981.70	305.70	00 100 0	8,301.00
KW SAVING PER YR																																									6.0	0.9					Ī		
EMCS.	2	-	4	7	- (6	4	- 1	7	m	7	-	ω.	4	4	-	3	2	2	3	4	-	2	-	4	က	4	e .	(7	4 C	1 (7	- 4	4	F	7	4	3	4	-	-	4	-	4	က	2 5	m +	- 4
SYSTEM	3	3	င		e (0	3	e (50	6	3	8	9	9	3	3	3	3	3	3	3	3	က	3	9	3	9	8	e (n (2 "	, ,	2 %	7 =	=	12	12	12	12	11	11	#	=	4	4	4	4		
SYSTEM NAME	AHU-10	AHU-10	AHU-2	AHU-2	AHU-2	AHU-2	AHC	AHU-3	AHU-3	AHU-3	AHU-4	AHU-4	AHU-4	AHD-4	AHU-5	AHU-5	AHU-5	AHU-5	AHU-6	9-NHV	AHU-6	AHU-6	AHU-7	AHU-7	AHU-7	AHU-7	AHU-8	AHU-8	AHU-8	AHO-8	AHO-9		PHO-DHA		당.	H.T.	出	上十	H-1	ACCU-1	ACCU-1	ACCU-2	ACCU-2	AHC-1	AHU-1	AHU-1	AHU-1	¥ .	F 4-1
BLDG DESCRIPTION	CLO SALES STORE & EXCH MAIN		CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES SIORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	OLO CALCO STORE & EXCHAMIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLO SALES STORE & EXCH MAIN	CLASS VI	CLASS VI		CLASS VI	CLASS VI	CLASS VI	CLASS VI	CLASS VI	CHILD SUPPORT CENTER	CHILD SUPPORT CENTER
BLDG NO.	10730 (10730										10730 (-	10730	10730	10730	10730	10730	10730	10730	10730 (10730						10730		10730	40720				10730	10730	10730	10730	10732	10732	10732	10732	10732	10732	10732	10732	10745	10745

TABLE E-2	A SUMMARY LISTED BY BUILDING
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SIMPLE	A/N	0.3	0.8	0.3	N/A	0.8	N/A	0.8	0.3	NA	0.2	A/N 7	6.7	N/A	0.1	N/A	2.9	0.8	0.2	NA	1.3	0.5	Y 7	1.5	0.3	NA	0.4	1.8	NA.	1.1	7.0 N/N	2.6	0.5	N/A	N/A	0.4	1.8	1.5	0.3	¥ v	0.14	1 2	S X	NA	0.2	0.6	DIN N
	ΑN	30.1	10.8	29.7	ΑX	10.6	ΑX	10.6	29.7	ΑN	43.8	47 A	2 6	N N	96.6	N/A	3.1	10.0	49.3	ΝA	6.9	16.7	0 0	0.9	33.6	ΑN	23.9	4.8	δ ς V	6.4	2. 4 V A/N	3.4	15.9	A/N	N/A	23.9	4.8	0.9	27.9	A/A	0.0	7 4	Į K	Α×	41.7	15.4	N/N
DISC.	512	18,190	3,909	17,922	212	3,839	512	3,839	17,922	512	25,230	8049	478	512	65,450	512	1,111	7,587	37,248	512	2,518	12,630	1 DGB	2.160	25,386	512	18,059	1,737	512	3,007	517	1,220	12,003	512	512	18,075	1,760	2,160	21,119	710	1,037	3 303	512	512	25,204	5.583	512
BLDG. INST. COST		604	363	604		383		363	904		9/9	472	363		756		363	756	756		383	80	363	383	756		756	363	200	363	900)	363	756			756	363	363	756	27.7	7/4	578	3		604	363	T
Point		-	-	-		-	1		-		2	-	-		-		-	-	=	1	-		-	-	-		-	-	,	-	-	-	-			-	-	-	+	7	+	,	1		-	-	F
POINT		-		-		İ		ŀ	-						2			2	2		(7			2		2			٢	7		2			2			2			+	-		٦		
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Polint		1		-				1	-						+			-	-		1				-		1			*	-		1			-		1	-			-			,		
COST SAVING PER YR	90	2,079	444	2,049	90	436	09	436	2,049	90	2,8/3	687	54	09	7,646	90	126	893	4,366	90	7 400	9,469	121	245	2,991	60	2,128	197	97	341 7 680	900,5	138	1,414	9	99	2,129	200	245	2,488	920	004	379	09	9	2,878	634	G
HOURS SAVING PER YR	3			•	က	(20			6				9		3				3		6	2			3		•	2		e			3	3				,	2			3	3			
LPG SAVING PER YR																																															
F. OIL #2 SAVING PER YR								-										-																													
District Htg SAVING PER YR		386.50	100.60	379.60	0	38.80	00	38.80	3/9.60	07.000	336, 10 15 90	155.70	12.30		459.80		28.60	16.40	178.60	00.00	94.80	00.5	27.50	55.60	31.90		25.60	44.70	77 40	44.40	7	31.40	18.00			26.00	45.30	55.60	31.90	103 00	14 80	59 50			552.10	143.70	
KWh SAVING PER YR		6,850.00		6,850.00				00 010	6,850.00	00 000 7	4,300.00				102,708.80			15,000.70	65,417.80		25 047 20	20,11,00			52,116.70		36,831.60			63 695 10	21.000		24,398.20			36,831.60		40.000	42,908.80			2.140.20			8, 103.00		
KW SAVING PER YR																																															
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SYSTEM EMCS NUMBER FUNC.	-	-	-	-			-		- (12	12	12	2	2	2	2	2	2	2	7	7 (2	2	2	2	2	2	2 2	7 0	2 0	2	2	2	2	2	2	2	2 2	7	1 5	1 5	12	12	-	-	1	-
SYSTEM	HV-2	HV-2	HV-2	HV-3	۶۰ ۲ ۲	?- <u>\</u>	7 2	4-VF	HV-4	¥ .	Ž Ž	Ž Ž	AHU-1	AHU-1	AHU-1	AHU-10	AHU-10	AHU-10	AHU-2	AHU-2	7-0LV	AHU-3	AHU-3	AHU-4	AHU-4	AHU-4	AHU-5	AHU-5	AHILA	AHIT-6	AHU-6	AHU-7	AHU-7	AHU-7	AHU-8	AHU-8	AHU-8	AHU-9	SHO-9	HE.1	#	¥ ¥	표-	HV-1	HV-1	HV-1	HV-2
	NTER	NTER	NTER	NTER	Z Z	NIEK	אותא	אות 1217	NITK I	NTER	NTER	NTER	R	Œ	Œ	٠ <u>د</u>	اع	١ ٢	돈 !	포 [בופ	1 2	<u> </u>	꼰	TR	꼰	꼰	<u> </u>	בופ	2 2	E E	TR	TR	딾	낊	씸	띰		<u>ج</u> 5	١ و	1 2	<u> </u>	胚	~	~	~	~
BLDG	CHILD SUPPORT CENTER	CHILD SUPPORT CENTER	CHILD SUPPORT CENTER	CHILD SUPPORT CENTER	CHILD SUPPORT CENTER	CHILD SUPPORT CENTER	CHILD SUPPORT CENTER	CHILD SUPPORT OF	CHILD SUPPORT CENTER	CHILD SUPPORT CENTER	CHILD SUPPORT CENTER	CHILD SUPPORT CENTER	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNIR	CHILD CARE CIVIR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CAIR	CHILD CARE CIVIN	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNIK	CHILD CARE CIVIN	CHILD CARE CNTR	CHILD CARE CNTR	CHILD CARE CNTR	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER
BLDG No.	10745	10745	10745	10745	10/45	10/45	10745	10/45	10/45	10745	10745	10745	10785	10785	10785	10785	10785	10785	10785	10/85	10/02	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10785	10790	10790	10790	10790

TABLE E-2 SYSTEM SUMMARY LISTED BY BUILDING	
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Particular Par																									_												_	_	=		_	_		_	=	==				=	=
Particular Par	SIMPLE	0.8	0.3	N/A	0.3	0.8	0.8	0.3	N/A	0.7	N/A	N/A	0.2	NA	56.0	26.0	NA	NA	56.0	N/A	56.0	N/A	56.0	N/A	56.0	N/A	56.0	NA	56.0	5.5	N/A	0.1	0.6	V/N	0.4	NA	0.5	N/A	0.4	8.8	0.2	3.9	N/A	N/A	21.1	6.5	N/A	81.6	10.0	Z Z	10.01
Control Cont	14. F. W.S.	10.8	30.1	¥ N	29.7	10.6	10.6	29.7	N/A	11.9	N/A	N/A	40.9	N/A	0.2	0.2	N/A	¥ Z	0.2	Ϋ́	0.2	ΑN	0.2	ΑN	0.2	ΑN	0.2	N/A	0.2	1.7	Y.V	63.0	16.1	Z Z	24.2	Ž	16.3	N/A	25.2	1.0	37.4	2.4	NA	NA	0.5	1.3	¥ Z	0.7	6.0	1 0	S. S.
Particular Par	SAVING		┺	512					512	5,614	512		_				512	512	44	512	44	512								1		_	16,190	542	12	-	Ľ	1,024	Щ			_	1,024							1	
National Parison National Pa	BLDG. INST. COST	363	604		604	363	363	604		472			576		289	289			289		289		289		289		289		289	1,007		843	1,007		534	3	1,007			-						388					
	AI	-	-		-	1	-	-		-			2																	2	'	2	2		-		2		2	2	7	2	Ш		2				2	ľ	7
No. OLIVIC CONTING C	DI POINT												-		-	-			-		-		-		-		-		-	8			9				3		2	3	2	3			4	_		2		\downarrow	
Particle Particle	AO EN I									•																													7		2		<u></u>		_	_	_		_	1	
Bandson	Polint																						-	_						m							- 2	0		2		_		0					0		0
BLOO SYSTEM SYSTEM ENCY SAVING SA	COST SAVING PER YR	444	2,079	9	2,049	436	436	2,049	8	637	90	20	2,685	9	2	ນ	9	9	TO.	99	5	99	LC)	09	ų)	99	ц,	9	4,	188	120	5,977	1,807	2 2	1 47	120	1,862	120	2,390	116	3,473	259		96							
NAME NAME	HOURS SAVING PER YR			3					3		3			3			3	3		3		3	-	3		3		3			9		9	0 6	,	9		9					9	3		3			3		2
BLOG SYSTEM SYSTEM SYSTEM FRY PR PR PR PR PR PR PR PR PR PR PR PR PR	LPG SAVING PER YR																																		_		0		0	0	0	0			0					_	
NAME NAME	F. OIL #2 SAVING PER YR																													30.60		516.70	. 183.80		176.80		135.2		203.1	14.9	431.3	44.3			6.7						
BLOG	District Htg SAVING PER YR	100.60	386.50		379.60	98.80	98.80	379.60		144.50		15.90	555.40						Constitution of the Consti																																
Bild System Sys	KWh SAVING PER YR		6,850.00		6,850.00			820					4,300.80																	929.80	:	06'680'69	18,743.00		12 338 90	14,000.00	23,532.00		27,032.20	939.40	29,948.00	1,296.60					173.50			1/3.50	
BLDG	KW SAVING PER YR														0.75	0.75			0.75		0.75		0.75		0.75		0.75		0.75										7.3												
BLDG SYSTEM DESCRIPTION NAME 0 YOUTH CENTER HV-2 0 YOUTH CENTER HV-3 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 YOUTH CENTER HV-4 0 CLINIC W/O BEDS ACCU2A	EMCS FUNC.	3	-	4	-	3	3	1	4	3	4	7	-	4	-	-	4	4	-	4	1	4	1	4	1	4	1	4	-	3	4	-	e .	4 4	÷ (*	, 4	6	4	-	3	-	3	4	4	7	4	9		4	٩	4
BLDG DESCRIPTION O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O YOUTH CENTER O O CLINIC W/O BEDS O CLINIC W/O BE	SYSTEM	-	-	1	-	1	-	-	1	12	12	12	12	=	7	+	1	=	=	1	11	11	11	11	11	11	11	11	7	7	7	7	7	•	4		7	7	7	7	7	7	7	10	9	13	8				8
	SYSTEM	HV-2	HV-2	HV-3	HV-3	HV-3	HV-4	HV-4	HV-4	HX-1	HX-1	HX-1	HX-1	ACCU1A	ACCU1A	ACCU1B	ACCU1B	ACCU1C	ACCU1C	ACCU2A	ACCU2A	ACCU2B	ACCU2B	ACCU2C	ACCU2C	ACCU3A	ACCU3A	ACCU3B	ACCU3B	AHU-1	AHU-1	AHU-1	AHU-2	AHU-Z	AHILA AHILA	AHU-4	AHU-4	AHU-5	AHU-5	AHU-5	AHU-6	AHU-6	AHU-6	B-1	₩.	B-2	CHR-1A	CHR-1A	CHR-1A	CHR-18	CHR-1B
																														ļ																					
	BLDG ESCRIPTION	SI TH CENTER	OUTH CENTER	DUTH CENTER	OUTH CENTER	OUTH CENTER	DUTH CENTER	OUTH CENTER	DUTH CENTER	OUTH CENTER	DUTH CENTER	DUTH CENTER	DUTH CENTER	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	INIC W/O BEDS	CLINIC W/O BEDS
NO. NO. 10790 10790 10790 10790 10790 10790 10790 10790 10790 10790 10790 10790 1105		X	¥	X	×	×	۲	۲	×	7	>	۶	¥	ರ	ر ا	ರ	ರ	ರ	겁	ಠ	d	ಠ	ಠ	ರ	ಠ	ರ	ರ	₀	ี่	ರ	ರ	ט	ರ	ت ا	5 0					ਹ											
	BLDG NO.	10700	10790	10790	10790	10790	10790	10790	10790	10790	10790	10790	10790	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050

TABLE E-2 SYSTEM SUMMARY LISTED

							_		_																			_													-							_
SIMPLE	PAYBACK	0.2	0.8	0.3	0.8	0.3	0.2	9.0	N/A	NA	0.8	0.3	NA	N/A	10.0	81.6	N/A	10.0	91.0	21.12	0.10	0.2	AW	2.2	10.0	0.3	N/A	N/A	17	N/A	11.0	4.1	0.2	AN .	4.0	Z Z	¥	N/A	56.0	NA	56.0	56.0	N/A	56.0	56.0	N/A	56.0	N/A
	S.	40.9	10.6	29.7	10.6	29.7	41.7	15.4	ΑN N	Ø.	10.8	30.1	¥ Ž	AN C	0.9	0.1	Š	0.9	- c	0.0	2.4	37.4	¥	3.9	6.0	24.8	ΑN	Ψ,	0.54	Z. AN	0.8	2.2	53.5	≸ i	7.07	Q Z	Ϋ́Ν.	A/A	0.2	ΑN	0.2	0.2	Y Y	0 2	0.2	N/A	0.2	Ø/N
TOTAL \$ DISC.	SAVING	23,571	3,839	17,922	3,839	17,922	25,204	5,583	512	512	3,909	18,190	512	8 5	512	9	512	512	00	60	2 410	31 489	8	1,426	512	15,001	512	128	23,109	512	622	781	32,287	512	21,247	1 024	8	1,024	44	512	44	44	512	44	44	512	44	512
TOTAL BLDG. INST.	5 - 10 - 5	576	363	604	363	604	604	363			363	604		000	905	578		602	3/0	200 578	1 007	843		363	602	604		1	0/0	7/4	773	363	604		843				289		289	588		289	289		289	
₹	POINT	2	1	-	-	-	-	•			-	-		(7			2		7	2	2		1	2	-		(7		2	-	1		7													
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Ao	POINT POINT POINT		-	-	-	-	-				-	-									8	,		•		1			-		-	-	-															L
8	POINT	1		-			-					-			•	2			7	2	7	2				-							-		7				-								1	L
SAVING	PER YR	2,685	436	2,049	436	2,049	2,878	634	8	90	444	2,079	90	6	3 '	7	8	90	- 8	67	259	3 473	6	162	90	1,737	8	15	280	09	71	89	3,725	9	2,383	2 2	6	120	5	99	5	רו	9 9	5 40	2 2	09	S	9
LABOR HOURS SAVING									3	3			9	(2	1		m							3		3			3				3	6	0 00		9		3		(E 6	?		3		8
MBtu LPG SAVING	PERYR										-																				ļ.,											1						L
MBtu F. OIL #2 SAVING	PER YR																		0	0.70	44.30	43130													203.10													
MBtu District Htg SAVING	PER YR	555.40	98.80	379.60	98.80	379.60	552.10	143.70			100.60	386.50												36.70		195.30		3.30	63.60	00.50	16.00	20.10	490.90															
KWh	PER YR	4,300.80		6,850.00		6,850.00	8,103.00				1	6,850.00	0.00	1/3.50							1 296 60	29.948.00	173.50			16,000.80		2 100 0	7,201.10				28,521.20	000	27,032.20		173.50											
KW	PER YR															1.03		8	3.	20	3													1	5.7				0.75		0.75	0.75		0.75	0.75		0.75	
		1	3	-	6	-	-	6	4	4	6	-	4 (9	4	-	4	4	-	1	- (*	,	9	9	4	-	4	,	- "	S 4	7	3	1	4	- 5	1 4	9	4	-	4	-	- -	4 <	+ -	-	4	1	4
SYSTEM	NUMBER FUNC.	12	-	-	-	-	-		-	-	-	-		80 0	20 0	ω :	ę,	80 0	۽ م	2 0	2	- 1	80	-	8	+	6	12	7 5	12	6	-	1	-	•	7	- 8	7	7	7	=	= ;	11	7	=	11	11	43
SYSTEM	NAME	HX-1	HV-4	HV-4	HV-3	HV-3	₩-1	¥.	HV-3	H-1	HV-2	HV-2	HV-2	CHR-1A	CHK-18	CHR-18	4	CHR-1A	₹.	F 65	SHIP SHIP	AHII-6	CHR-10	HV-2	CHR-10	HV-1	HX-1	HX-1A	4 - Y	HX-14	EX-1	HV-1	HV-2	HV-2	AHC-5	1-VI	CHR-1B	AHU-5	ACCU1C	ACCU2B	ACCU2B	ACCU2A	ACCU1C	ACCU1B	ACCU2C	ACCU1A	ACCU1A	1.4
																			T																													
BLDG	DESCRIPTION	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	YOUTH CENTER	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	SCHO CIVIC DECIS
BLDG	9	10790	10790	10790	10790	10790	10790	10790	10790	10790	10790	10790	10790	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	44050

TABLE E-2 YSTEM SUMMARY LISTED BY BUILDIN
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SIMPLE	81.6	10.0	N/A	81.6	4.1	0.35	N/A	0.16	2.24	ΝΑ	N/A	10.96	1.68	N/A	0.20	N/A	N/A	N/A	40.15	40.15	N/A	A/A	2.00	N/A	2.00	ΑΝ	17.09	NA	17.09	Y.	17.09	N/A	1100	80.71 VIV	17.00	δυ. / I	17 09	17.09	N/A	N/A	17.09	17.09	ΝΑ	17.09 N/A
<u> </u>	0.1	6.0	¥,	0.1	2.2	25	ΑN	53	4	N/A	ΝΑ	1	5	N/A	44	N/A		N/A	0	0	ΑX	N/A	5	A/N	5	Ν	-	N/A	-	ΑX	-	Y S	2	- 0/14	-	- V/N	-	-	¥.	₹ N	-	1	ΝA	- K
TOTAL \$ DISC. SAVING	09	512	8	9	781	15,001	512	32,287	1,426	512	512	622	2,471	128	25,109	512		512	132	132	512	512	2,851	512	2,851	512	202	512	202	512	202	512	710	512	200	512	202	202	512	512	202	202	512	202
TOTAL BLDG. INST. COST	578	602		578	363	604		604	363			773	472		976		100		602	602			602		602		363		363		363		Š	505	252	200	363	363	3		363	363		363
AI		2			1	1		1	1			2	1		2				2	2			2		2		-				•		1		•			-				-		-
DO AO DI POINT POINT POINT	2			2		ŀ		ļ							1		1																											
AO					1	1		1	1			1	1																-					-	-		-	-			-	+		
Polivi TNIO	2			2		1		1							1																													
SCOST SAVING PER YR	7	9	6	7	88	1,737	9	3,725	162	9	9	71	280	15	2,855	09		90	15	15	90	9	300	99	300	90	21	9	21	09	21	90	6	60	5	17	2 8	2	09	09	21	21	90	21
LABOR HOURS SAVING PER YR		3					3			3	3					3		3			3			3		3		9		3		e (3		4			3	3			3	3
MBtu LPG SAVING PER YR																							49.50		49.50		3.50		3.50		3.50		0	3.30	2 50	3.30	3.50	3.50	8		3.50	3.50		3.50
MBtu F. OIL #2 SAVING PER YR															:																				200									
MBtu District Htg SAVING PER YR					20.10	195.30		490.90	36.70			16.00	63.60	3.30	619.00				3	3															:									
kWh SAVING PER YR			173.50			16,000.80		28,521.20							2,287.70																													
KW SAVING PER YR	1.03			1.03																																								
EMCS FUNC.	-	4	9	-	3	+	4	1	3	4	4	7	3	7	1	4		4	7	7	4	4	7	4	7	4	3	4	က	4	e .	4 4	t (2 2	7 0	2 4	r e		4	4	က	3	4	8 4
SYSTEM EMCS NUMBER FUNC.	8	8	80	8	-	1	*-	+	-	-	6	6	12	12	12	12		10	10	10	10	10	10	9	ţ,	6	-	1	-	-		- ,	- -		-		-	-	-		-	-	1	
SYSTEM	CHR-1B	CHR-1C	CHR-1C	CHR-1C	HV-1	HV-1	H-1	HV-2	HV-2	HV-2	Ŧ-Ŧ	¥-1	HX-1A	HX-1A	HX-1A	HX-1A	ELEC	B-1	B-1	B-1	В-1	Р	ф Т	B-2	B-2	HX-1	MAU-1	MAU-1	MAU-10	MAU-10	MAU-2	MAU-2	MAG	MAU-3	7 1 4 1	WAC A	MALLS	MAILA	MAU-6	MAU-7	MAU-7	MAU-8	MAU-8	MAU-9 MAU-9
BLDG DESCRIPTION	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	CLINIC W/O BEDS	ELEC SUBSTATION	EMTOMOLOGY FAC	EMTOMOLOGY FAC	REFUSE COLL BLDG	REFUSE COLL BLDG	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	LIGHTAN NICH	MAIN WASH	HOVA NIVA	MAIN WAN	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH	MAIN WASH MAIN WASH
BLDG NO.	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11050	11130	11142	11142	11144	11144	21510	21510	21510	21510	21510	21510	21510	21510	21510	21510	21510	OLCL7	21510	21210	01017	21510	24540	21510	21510	21510	21510	21510	21510

APPENDIX F COST ESTIMATES

(To be used in a future submittal)